THE NEUTRAL ZONE

# THE HEATING AND VENTILATING MAGAZINE

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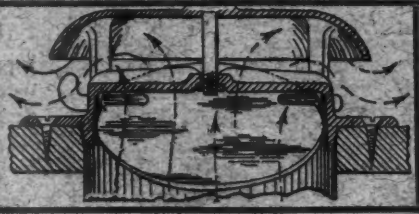

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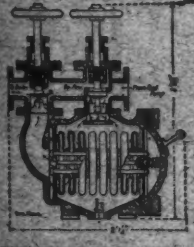

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THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK JUNE, 1912

# *Neutral Zone in Heating and Ventilating**

BY L. BIRO.

In a hall or any interior where the temperature is lower or higher than the external temperature, there exists between the floor and ceiling a single horizontal plane where the pressure is equal to the external atmospheric pressure.

If in this plane, called the neutral zone, an opening be cut into the walls there would be neither inflow nor outflow of air. On the other hand, if openings be cut under and above this zone, there would be inflow of air through one and outflow through the other.

Let us suppose, for instance, an interior, abcd (Fig. 1) with walls that are absolutely impermeable and containing heated air at a temperature $t_i$ higher than the external temperature, $t_e$. The internal pressure will increase in proportion to the absolute temperature and if we cut an opening, O, in a vertical wall (Fig. 1) the air will flow out until the internal pressure at O becomes equal to the atmospheric pressure. Above and below O we will have pressure conditions indicated by the straight line A—B. Below O there will be a negative pressure and above a positive pressure, as linear function of the vertical distance from O. The external air will tend to enter the interior through Od and the internal air will tend to go out through Ob.

The cause of this phenomenon is easy to explain. The external air has a greater density. The internal pressure exerted on the ceiling ab, in

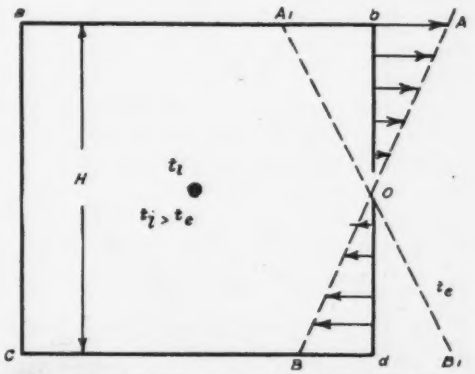


FIG. 1—DIAGRAM OF AIR PRESSURES IN BUILDING WITH IMPERMEABLE WALLS.

ounces per square foot, is evidently equal to

$$(d_e - d_i) \times bO$$

where $d_e$ equals weight of external air in ounces per cubic foot, and $d_i$ equals the weight of internal air in ounces per cubic foot.

On the other hand, the negative pressure existing at the floor can be calculated from

*From a paper read before the Association des Ingenieurs de Chauffage et Ventilation de France, January 19, 1912.

$$(d_e - d_i) \times Od$$

From these two equations it follows that the difference between the pressures at the floor and ceiling is equal to

$$(d_e - d_i) \times H$$

where H is the height of the interior.

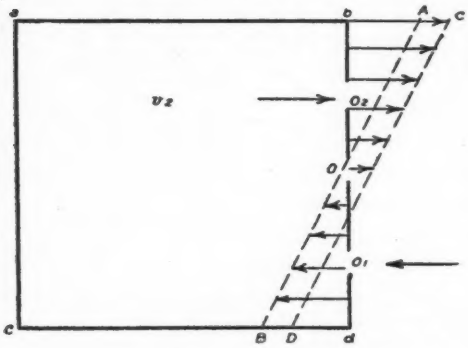


FIG. 2—DIAGRAM OF AIR PRESSURES WITH PERMEABLE WALLS.

If the internal temperature becomes equal to the external temperature, the line AB will coincide with the vertical wall bd. If it is less, the line AB will take the position A′B′; the external air being warmer, the tendency will be for it to enter the interior above O; the internal air, being colder, will flow out at Od.

If the walls of the interior in question are as we have supposed, impermeable, the positive and negative pressures mentioned constitute a potential energy having no tendency to expend itself and to produce any result. However, in practice, such a case is almost never met. We must assume permeable walls with motion of air indicated by the arrows in Fig. 2.

Let us represent by the opening $O_1$ the sum total of the exit surfaces and openings of all kinds under O. Let us do the same with the exits of air above O and call this sum of openings $O_2$. If the air enters below with a velocity of $v_1$ and goes out above with a velocity of $v_2$, evidently $O_1 v_1$ equals $O_2 v_2$, because volume of air going out will be equal to that entering under the neutral zone. Let us now suppose $O_1$ considerably enlarged by, for example, opening a door, a window or damper in the rear. At once there will be a new condition of pressure. The product $O_1 v_1$ will remain sensibly the same, but $v_1$ will become less (because of the new opening O). The ordinate Bd will become less and the line of pressures CD will be displaced towards the new enlarged opening.

The position of the neutral zone is always near the more permeable walls and all enlarged openings; any increase whatever of permeability will bring about a displacement of the neutral zone towards the enlarged opening.

The line of pressures is displaced, other conditions being equal, always parallel to itself.

This results from the equation indicating the difference in pressure between the floor and the ceiling which contains only the height of the interior and the air densities, external and internal. Wherever the neutral zone is, the pressure difference existing between the floor and ceiling is constant.

On the other hand, once the conditions are established and without any

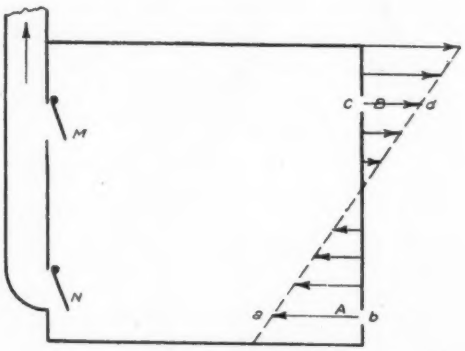


FIG. 3.—DIAGRAM SHOWING NATURAL NEUTRAL ZONE.

alteration in openings, the line of pressure will turn always about the same neutral point and its position and inclination will be affected by the temperatures $t_e$ and $t_i$ only.

### DETERMINING THE NEUTRAL ZONE IN PRACTICE.

These theoretical considerations now brought out, let us see how and

where the neutral zone is to be determined in practice. We must say that, unfortunately, its position cannot be calculated in advance. Generally, in interiors with plaster ceilings and of normal construction, the neutral zone is found a little higher than half the height of the interior. When the interiors have skylights or roofs which are not very air tight, the neutral zone will be found much higher, very near the top, because the leakage tends to raise the neutral zone, as already explained.

Let us call the position which this zone takes, when no mechanical or other device is used, the natural neutral zone is contradistinction to the artificial or mechanical neutral zone which we shall consider later.

WHEN THE AIR IS CHANGED BY NATURAL VENTILATION.

A glance at the diagram of the natural neutral zone (Fig. 3) explains the continuous change of air, the so-called natural ventilation of heated interiors. Though this change of air is often very insignificant, it frequently prevents the complete vitiation of the air. The diagram of pressures

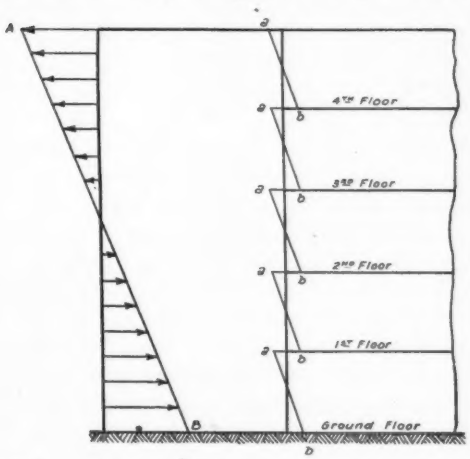


FIG. 4.—DISTRIBUTION OF NEUTRAL ZONES IN A BUILDING.

also indicates what we can do with the forces which exist.

Fresh air should be introduced (in winter, of course) as low as possible and the vitiated air taken out as high as possible.

When we use a small amount of energy for the ventilation of an interior and when we attempt to reduce this expenditure of energy as much as possible, the fresh air should be introduced under the neutral zone at A (Fig. 3) because the negative pressure, ab, can be subtracted from the pressure to be obtained in the interior. The removal of air should be accomplished above the neutral zone at B, because the positive pressure, cd, will be an aid.

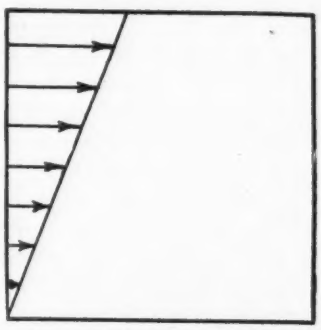

FIG. 5.—AIR PRESSURES IN ROOM WITH IMPERMEABLE WALLS.

On the other hand, ventilation in winter should be obtained by exhaust openings placed high and the ventilation in summer by openings placed below the neutral zone, because, in the first case, there is positive pressure above, and, in the second place, positive pressure below. The damper, M, should be open in winter, and the damper, N, in summer.

CONDITIONS IN INTERIORS WITH SEVERAL FLIGHTS OF STAIRS.

In heated interiors having a considerable height, as, for instance, those containing several flights of stairs, halls of large stores and public buildings, etc., the pressure differences can be very large. For example, Fig. 4 shows a series of flights of stairs or hall a number of floors in height.

The lines ab indicate the individual pressure conditions of each floor isolated from the hall. The line AB indicates the considerable pressure differences which obtain in the hall because of its height. If any of these floors be opened to the hall, the pressure obtaining at that level of the hall is communicated to that floor, and there will be in the latter a pressure equal to the algebraic sum of the two pressures.

If the fourth floor be open to the hall or to the stairways, a large positive pressure will result. Evidently the contrary will obtain when a door or a window on the ground floor connecting to the hall is opened. The large negative pressure existing will be transmitted to the ground floor. Therefore, if the chimneys or boilers do not draw well on the ground floor, it would not help matters to connect with this hall pressure. On the upper floors, however, due to the high positive pressure, the draft will be much increased.

For the same reason the kitchens or other places where odors or smoke would be a nuisance should, if possible, be located on the upper floors where a simple communication with the hall will prevent the spread of such odors throughout the building.

We have seen that the natural neutral zone is more frequently above the floor. This condition, in winter, is very inconvenient, especially in large halls or concert rooms, large stores, hotel halls, banking rooms, etc. An example will best explain the subject.

Take, for example, a theatre or central hall of a large store, 80 ft. high, heated to 70° F. with an external temperature of 32° F. The ceiling being fairly air tight, the neutral zone will be at half the height. The weight of a cubic foot of air at 32° F. is 0.0808 lbs., and that of air at 70° F. per cubic foot is 0.075 lbs. The pressure obtaining at the floor will, therefore, be $(0.0808 - 0.076) \times 40 = 0.232$ lbs. per square foot, producing a velocity of $28.8 \times 0.232 = 13.8$ ft. per second. If, therefore, an entrance door be opened, the occupants who are near will receive a douche of cold air penetrating the hall with a velocity of about 13.8 ft. per second. In reality, this velocity will be a little less than 13.8 ft. because in opening the door the neutral zone will be lower somewhat and the negative pressure will be reduced. We try to remedy such a condition by installing a large number of entrance doors or revolving doors. The correct solution is not found in this manner, but in the artificial lowering of the neutral zone.

### NO COLD DRAFTS WITH NEUTRAL ZONE BELOW FLOOR LEVEL.

In fact, if the neutral zone is at the level of the floor or under, all the parts of the hall in question are at a pressure higher than that of the external atmosphere. In opening a door the external air cannot penetrate the interior, but there will be an outflow of air. In order to get this result, it is generally sought to obtain a feeble positive pressure of 1 to 1.6 oz. per square foot at the level of the floor; that is to say, to lower the neutral zone below the floor. It is useful to obtain this feeble positive pressure at the floor because, in opening a door, the neutral zone is made to rise, and otherwise we would have a feeble negative pressure at the level of the floor.

It can be said that, wherever it is a question of heating an interior of a certain height, this artificial lowering of the neutral zone is very desirable and very often indispensable in order to avoid annoying air currents.

### METHODS OF CONSTRUCTION TO LOWER NEUTRAL ZONE.

What are the methods to obtain this result? Evidently, the hall must be constructed with fairly air tight ceilings and we must diminish, as far as possible, the outward and inward air leaks at the upper levels. In any case, whatever the condition of air tightness of the construction may be, the neutral zone will always be found above the floor, because the neutral zone is found very near the floor in the most favorable conditions; that is to say, in an interior having walls which can be considered impermeable (Fig. 5) and in permitting openings to the external atmosphere near the floor, the neutral zone is made to rise.

The artificial lowering, but not mechanical, of the neutral zone can be obtained by the methods shown in Fig. 6. Naturally, the lowering will be greater the lower the areaway is cut. In any case, unless you construct formidable pits, it is difficult to lower the neutral zone below the floor. If one or more doors be opened there will be an inflow of cold air which must be heated by the pipes C, fed by

steam or hot water, and placed in front of the openings in the walls.

The real solution of the problem is in the blowing in of a volume of air sufficient to create everywhere in the hall a positive pressure and to obtain

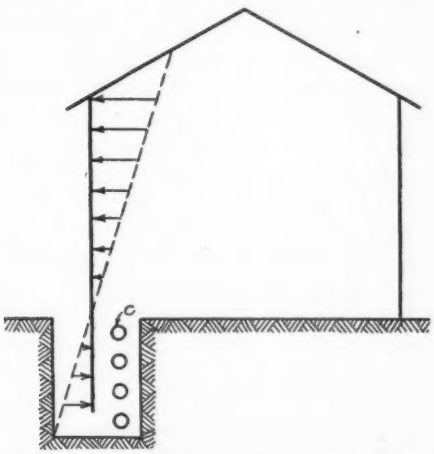


FIG. 6.—ARTIFICIAL, NON-MECHANICAL LOWERING OF THE NEUTRAL ZONE.

a mechanical lowering of the neutral zone below the level of the floor.

VOLUME OF AIR REQUIRED TO LOWER NEUTRAL ZONE TO FLOOR LEVEL.

The first problem which presents itself in the examination of this question, is the following: What is the volume of air required to be blown in? Unfortunately, we do not have at present sufficient data to be able to indicate the figures even approximately for typical constructions.

Though we have sufficiently exact data concerning the permeability of certain materials of construction, the calculation becomes well-nigh impossible in most cases because we cannot determine the action of the wind and of the air tightness, more or less large and variable, of the joints, doors and windows.

There are cases, very rare, for which we can give a fairly precise calculation of the volume of air necessary to maintain the neutral zone at a given level. These cases are met when the walls are absolutely homogeneous, having everywhere the same thickness. We can then make use of our coefficients of permeability. By the latter is meant the number corresponding to the volumes of air which pass through a square foot of surface under a pressure difference of 1 oz. per square foot on the two sides of the wall.

The following example will indicate the method of procedure:

Take, for example, an interior without windows, having a single door which is very air tight and constructed of homogeneous walls. The temperature of the interior is very high, and it is desired by a mechanical scheme of ventilation to prevent the poisonous gases from going out. The neutral zone must, therefore, be raised above the ceiling to P (Fig. 7) in order to have a slight negative pressure, cd, at the ceiling.

Knowing the greatest temperature difference between the interior and exterior, we can determine the negative pressure, fg, at the floor. In order to obtain the desired result, we must blow on each of the four vertical walls the volume

$$V = S \times \frac{cd + fg}{2} \times p_1$$

where S is the surface of the wall,

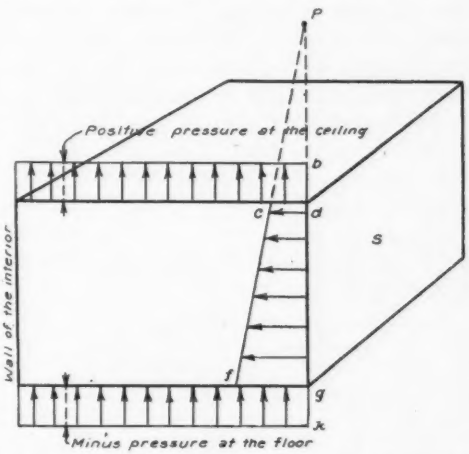


FIG. 7.—ELEVATION OF THE NEUTRAL ZONE IN AN INTERIOR WITH HOMOGENEOUS WALLS.

$$\frac{cd + fg}{2}$$

is the surface of cdfg, representing the negative pressure to be produced, and $p_1$ the coefficient of permeability.

The volumes passing through the ceiling and floor are given by $S_1 \times bd \times$

$p_1$ and $S_1 \times gk \times p_2$, where $S_1$ is the surface of the floor or of the ceiling and bd and gk the negative pressures at these two points; $p_1$ and $p_2$ are the coefficients of permeability of these two surfaces.

This method of calculation can sometimes be employed in the case of ventilation of refrigerator interiors, hot houses, underground vaults, storerooms, etc. In case of structures with walls of varying materials and thicknesses and much window surface, the above method is useless because we cannot take account of the infinity of small leaks through the small joints more or less air tight. In such a case we must obtain results by trial.

Some data have been published, especially by German specialists, on the volume necessary to lower the neutral point; but the diversity of structures and the lack of figures do not allow of precise calculation.

It is unnecessary to mention that the determination of the volume required to blow in depends on other things: the elimination of carbonic acid gas and the dissipation of heat. The problem of the lowering of the neutral zone is associated with the other problems mentioned above and the equipment must be able to give the largest volumes required by the combined solution of these different problems. We will limit ourselves here to the study of this problem exclusively from the standpoint of the lowering or raising of the neutral point.

It is evident that engineering judgment should guide the engineer in the choice of volume to introduce into interiors to ventilate where a positive pressure must be brought about throughout. The engineer must then observe and regulate the result. Since the engineer must rely on his judgment or, at least, on approximations, he should use the simplest and most economic methods to reduce these approximations to a minimum.

Two typical cases will be considered: first, an interior that is not very air tight where it has been observed that there are cold air leaks and that the neutral point is above the floor at P (Fig. 8). In order to remedy this, we wish to lower the neutral zone to $P_1$, in order to obtain a positive pressure at the floor of about 1.6 oz. per square foot which would cause the line of pressure AB to be displaced to a parallel position, A′ B′.

The first thing to do is to locate the neutral zone. This can be done by an inclined micromanometer (Fig. 9) enabling readings of 0.004 to 0.0015 in. The pressure in the interior is

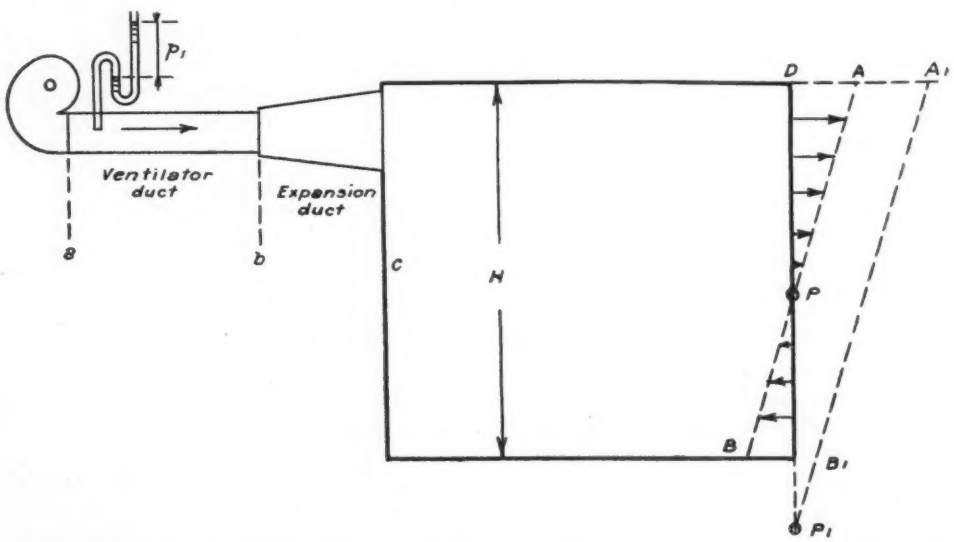


FIG. 8.—MECHANICAL LOWERING OF THE NEUTRAL ZONE, INTERIOR NOT VERY AIR TIGHT, WITHOUT EXHAUST DUCTS.

read for various heights and with particular care at the floor and at the ceiling. Plotting the ordinates that we obtain to scale we will get a line which is practically straight, the intersection of which with the vertical will give the neutral point, P. It is not necessary to mention that the two

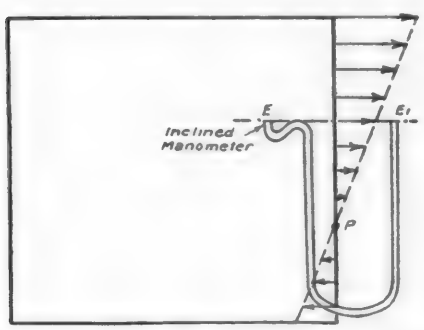


FIG. 9.—METHOD OF DETERMINING POSITION OF THE NEUTRAL ZONE.

extremities, E and E′ should be on an exact level.

It is evident that in the case under consideration the volume must be increased in order to lower the neutral point to $P_1$. The diagram (Fig. 10) indicates the increase necessary.

The part, ab, indicates schematically the supply duct and bc indicates the expansion duct. It is advantageous to introduce the air into the room at a reduced velocity and as low as possible as indicated in Fig. 8. Two important results will thus be obtained: (1), ventilation without air currents, and (2), increase of pressure within the interior, since, according to Bernouilli's theorem, any diminution in velocity will cause the pressure to increase.

The pressure, $p_1$, is measured at the fan outlet (rotating with a speed $n_1$) after having measured the pressure, AD, at the ceiling of the interior. Drawing the parallel line, A′B′, we find that we must have a positive pressure of 1.6 oz. per square foot at the floor. In order to obtain this result, evidently we must increase the pressure at the fan opening from $p_1$ to $p_2$. The ratio $\frac{p_2}{p_1}$ being equal to the ratio $\frac{A'D}{AD}$ we can calculate $p_2$. Since the pressure given by a fan operating on a certain circuit is proportional to the square of the speed, we can determine the number of revolutions, $n_2$, which the ventilator should have

$$n_2 = n_1 \sqrt{\frac{p_2}{p_1}}$$

in order to obtain the desired positive pressure at the level of the floor.

The second typical case is that of an interior which is fairly air tight where ducts, either open or equipped with dampers, have been provided for the outlet of the vitiated air (Fig.

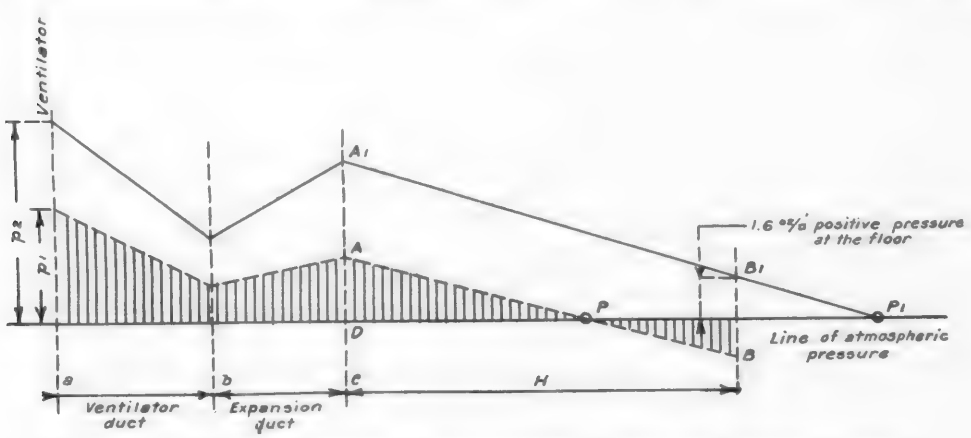


FIG. 10.—DIAGRAM OF PRESSURE DISTRIBUTION IN INTERIOR SHOWN IN FIG. 8.

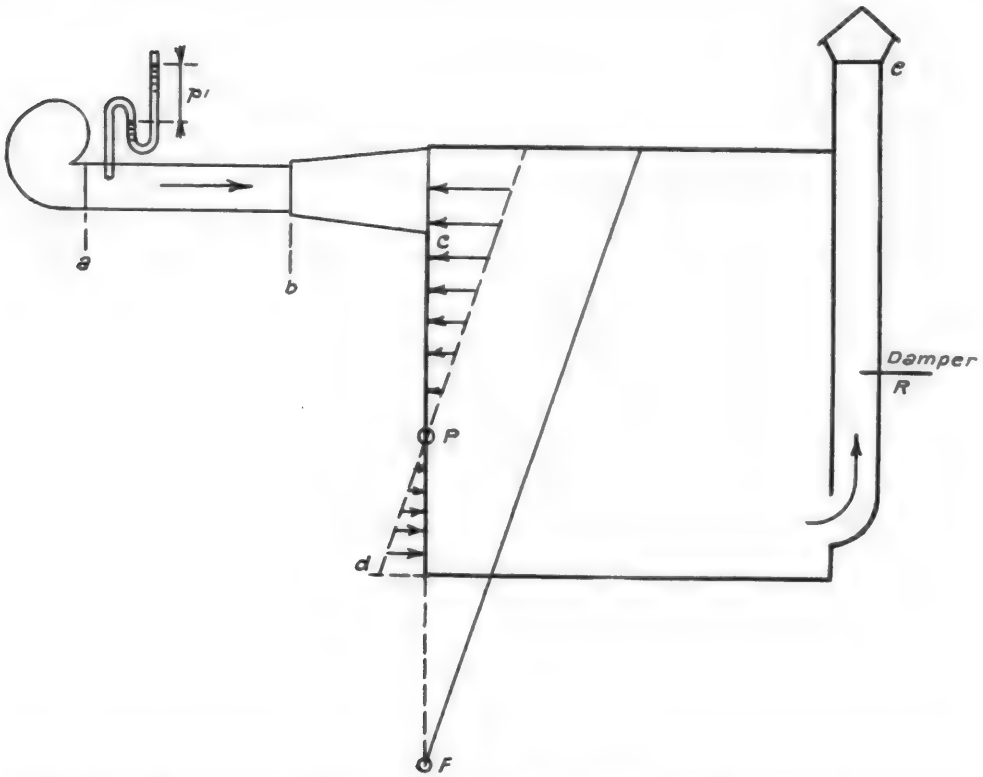


FIG. 11.—THE MECHANICAL LOWERING OF THE NEUTRAL ZONE, INTERIOR PROVIDED WITH EXHAUST DUCTS

11). Here again the pressure diagram (Fig. 12) will indicate what should be done to obtain a positive pressure at the level of the floor. The dotted line indicates the pressure conditions before regulation, with neutral point P above the floor. In order to lower P to $P_1$, the damper, $R_1$, must be more nearly closed, which would cause the pressure to increase and the line of pressure to rise in a manner analogous to that represented in Fig. 10. The full line of Fig. 12 indicates the new conditions after regulation by the damper R. It follows, of course, that the supply of the ventilator will dimish somewhat and the speed will have to be increased in order to obtain the volume desired.

Another solution is given by the

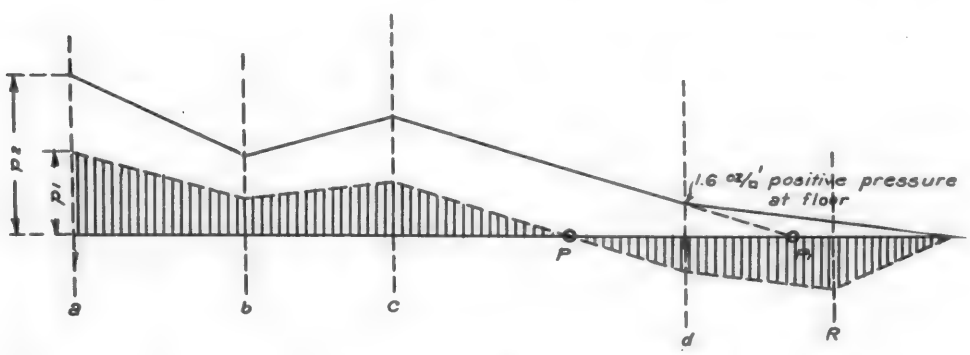


FIG. 12.—DIAGRAM OF PRESSURE DISTRIBUTION IN THE CASE OF THE INTERIOR SHOWN IN FIG. 11.

method termed "antrakometric" used to measure the change of air in an interior. The amount of carbonic acid gas in the air of the interior is artificially increased to a considerable extent by burning gas or by exploding $CO_2$ bombs. The amount of $CO_2$ per unit volume is measured at the

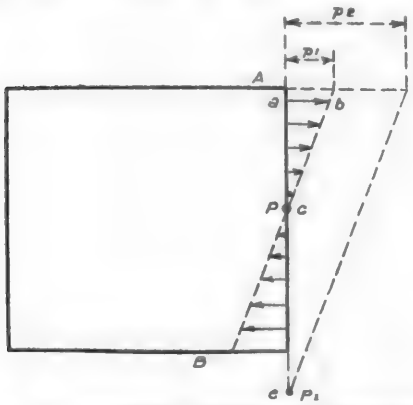


FIG. 13.—ANOTHER METHOD OF DETERMINING NEUTRAL POINT AND DESIRED PRESSURE.

beginning and at the end of a certain period, one hour, for example. We can then calculate by the aid of Seidel's formula, the volume of air, V, which has leaked in throught the walls of the interior. The position of the neutral point, $P_1$, and the pressure, $p_1$, at the ceiling is then determined mined (Fig. 13).

In order to bring the neutral zone under the floor to $P_1$, we must have at the ceiling a pressure $p_1$. The volume of air $V_1$, to be blown in to obtain this result, is approximately:

$$V_1 = V\left(\frac{p_2}{p_1}\right)^2,$$

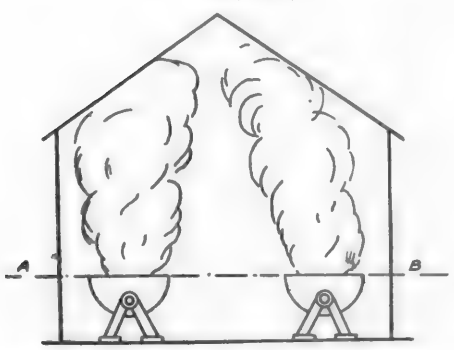


FIG. 14.—DIAGRAM OF SHOP IN WHICH VAPOR IS GENERATED.

since we can use Poiseulle's law for porous materials, according to which law, the volume of air passing through capillary openings is a linear function of the pressure. The volumes passing through the wall, AB, will, therefore, be proportional to the surfaces of the two triangles abc and ade; that is to say, to the square of the heights, $p_2$ and $p_1$ of these two triangles. Though this solution is more elegant and does not necessitate a previous test with a ventilator it does not seem to give indications which are very precise, because Poiseulle's law does not seem to be applicable to walls more or less air tight employed in the construction of halls.

When it is a question of important interiors where it is very useful and

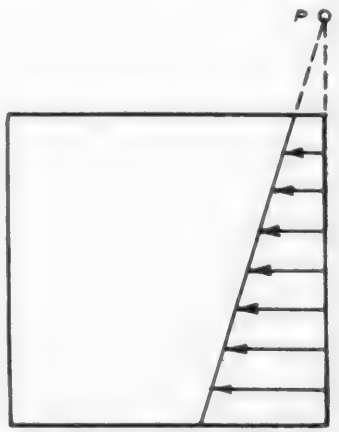


FIG. 15.—DIAGRAM OF BUILDING REQUIRING THE RAISING OF THE NEUTRAL ZONE.

very desirable to control the volumes, the temperatures and the pressures from a central control board, micromanometers terminating at the level of the floor will enable the person in charge of this work to observe the pressure obtaining at this place. If the positive pressure desired is not obtained, the velocity of the ventilator will be increased by a rheostat or the damper, R, will be closed more, the operation of which can be accomplished equally well at a distance, or, if possible, both these operations can be combined.

The lowering of the neutral zone is a problem which comes up rather

frequently in industrial ventilation when, for example, we wish to prevent dust or odors from penetrating into certain places or to prevent the entrance of external air. It would take us too far to treat these problems in detail. To give a typical case, reference may be made to the dissipation of vapor in some shops (see Fig. 14). Here the neutral point must be lowered in winter under the plane AB—the surface of cisterns or tubs producing the vapor—otherwise cold air

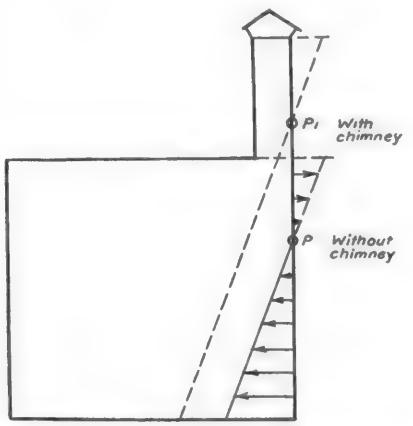


FIG. 16.—ARTIFICIAL NON-MECHANICAL RAISING OF THE NEUTRAL ZONE.

will rush in which will often prevent the desaturation of the air in the interior and the absorption of the vapors.

THE RAISING OF THE NEUTRAL ZONE.

So far we have considered the artificial lowering of the neutral point. The inverse problem, that is to say, the raising of this point above the ceiling (see Fig. 15) is met wherever we wish to prevent odors, smoke, dust or vitiated air from entering adjoining places. Such is the case in kitchens, offices, certain industrial interiors, laundries, hospitals for infectious diseases. etc.

Fig. 15 indicates that in raising the neutral point to P all parts of the interior are at a negative pressure and there can be no flow of air to the exterior. It is well to maintain a feeble negative pressure, 0.013 to 0.02 in. of water at the level of the ceiling because in opening the door, the neutral zone descends and, even in this case, we must be sure that the highest point of the interior has a negative pressre.

All we have said above concerning the lowering of the neutral zone applies as well and in a manner absolutely analogous to the raising of the neutral zone. The chimney represented in Fig. 16 corresponds to Fig. 6 and it constitutes an artificial device for the raising of the neutral point. However, this system is very often inapplicable because very rarely do we have sufficient height and sufficient temperature difference which would be necessary to always insure a sufficient raising of the neutral point.

Just as the blowing in of a certain amount of air lowers the neutral point, the suction of a certain amount of air raises it and, if the suction is sufficient, the neutral zone will be above the ceiling. The control can be effected in a manner absolutely identical to that shown in Figs. 10 and 12. If the interior to be ventilated is not very air tight, the negative pressure $P_2$, to be obtained at the opening of the ventilator is determined after having observed the conditions of pressure at the ceiling.

In the case of an interior which is fairly air tight and in which there is air suction, the damper placed in the air duct will be opened more which will cause an increase in the outflow and a raising of the neutral point. The same remark applies to the control of these installations.

A micromanometer terminating at the level of the ceiling will enable the operator to assure himself whether it is not necessary to increase the velocity of the suction blower or to open a damper to obtain a slight negative pressure at the ceiling and to assure himself whether bad odors or deleterious gases cannot escape.

The raising of the neutral point also plays a very important role in industrial ventilation. A large number of problems; such as the removal of poisonous gases, of smoke, of vapors and of dust make it necessary to con-

sider it. It would be beyond the scope of this paper to treat them even superficially.

In conclusion, we can say that the natural neutral zone is never sufficiently low or sufficiently high to avoid certain troubles and the latter are greater, the greater the temperature difference betwen the interior and the exterior and the greater the height of the interior. There is but one sure and certain method of avoiding them and that is the blowing in or the exhausting of a sufficient volume of air. This volume must be regulated and controlled with precision in order to obtain as efficacious and as economical an operation as possible.

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# *Ventilation Problems in Hospitals and Schools*

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(*Concluded.*)

### I—The Thermostat and Thermometer

Too narrow an interpretation of the records of physical apparatus leads to many curious fallacies. One of the commonest of these is that with a given ventilation system, an unvarying thermometric record is a test of its efficiency. Hence, also, the fictitious value of the thermostat. A distinguished educator, writing in defense of the closed ventilation system (i. e., without open windows), states: "I can testify that there is one school building of 50 classrooms in New York City where thermostats regulate the temperature so that it never varies a single degree," and he goes on to say that "the instrument is quite as reliable as a good watch." May I add that it is of just as much value as a proof of proper ventilation?

Nature certainly intended man to have the stimulus to respiration and circulation of varying temperatures. The day and night temperatures vary naturally the world over, except, perhaps, in the "dog days" of midsummer, and then we all know how we feel! All the vital phenomena of the body are gauged for the stimulus of change and rhythm.

In a hospital to which I have already referred, which was ventilated by the most expensive and elaborate closed system, in an investigation of this system by the Medical Board, the engineer was called upon to give some explanation. Now the average engineer of a hospital or public school to whom the important matter of regulating the ventilation is entrusted knows about as much concerning ventilation as a hibernating dormouse. This man, resenting what he deemed a personal criticism, said: "I can prove how good the ward ventilation is, for here is a chart of the ward thermometer records, showing that for months the air has not varied a single pont from 70° F. "(!) The Board promptly passed the rule that the night temperature should be kept at least 5° F. lower than the day temperature, and, further, that during the day the windows should be opened at intervals (after the morning stools, again after the admission of visitors, etc.), no matter what the outside or inside temperature might be.

### II—Cubic Feet Estimation

A second fallacy, common among mechanical engineers, is the belief that computation of the number of cubic feet of air supplied by artificial force to a ward or schoolroom, is absolute proof of the quality of the ventilation. There might be some reason in this belief if a block, so to speak, of good air could be inserted in a ward and simultaneously drive out another compact block of foul air, as one may fill or empty a syringe with

air, or work an air pump. A most elementary knowledge of the laws of almost instantaneous diffusion of gases, however, shows how impossible it is to thus "completely" change the air in a ward so many times an hour.

If good air is forced in, it mingles with the foul air, and, in the exhaust, a mixture of good air and foul air may be withdrawn. But there are always certain currents of such air, despite the diffusion, in a large ward, which are dependent upon differences in temperature at different levels, obstructions of various kinds, and the shape of the room, which give rise to stagnant areas where the air is very slowly changed. Experiments with smoke and various odors afford ample proof of these facts.

Fresh, clean outdoor air, admitted through a window, is, of course, subject to the same laws of diffusion, but it has the advantage of purity, has not been superheated, and the difference in temperature which exists, at least, in winter, favors interchange more rapidly with the ward air. Moreover, its circulation may be favored by the simple expedients of electric fans in the ward and a few vents in the wall fitted with gas jets, to maintain outward currents, expedient which in no wise impair the freshness of the air.

If steam or hot water radiators be placed by the windows, the entering air is warmed to the desired temperature without being roasted, or, in fact, raised much beyond the proper temperature for inhalation and for comfort.

Heating and ventilation, of whatever kind, should always be entirely independent, for it is their combination which gives rise to the chief objection to artificial systems.

### III—Hygrometry

A third fallacy is that hygrometry affords a complete test of the fitness of the air for breathing. It is rather a pity that this test is having at present so much attention focussed upon it, for it tends to divert investigation from other directions. I have listened to essays by enthusiasts according to which, so long as the air was kept at 65° F., with a relative humidity of 60%, it was perfect for purposes of respiration, although it might previously have been breathed by a dozen persons and might contain sulphuretted hydrogen, marsh gas and carbon dioxide in large proportion (all of which gases are developed in the body), or it might have contained 50% of illuminating gas, for all that was stated to the contrary!

Professor C. E. A. Winslow, in a paper on "The Scientific Basis for Ventilation Standards," writes: "The chief factors for air conditioning for the living machine, *which, in most cases, far outweigh all other factors put together* (italics mine) are the temperature and humidity of the air." Dr. Henry Mitchell Smith, in a paper on "Indoor Humidity," writes: "Generally speaking, dry air is an excitant often causing sleeplessness and irritability, accompanied with a drier skin and quickened pulse. Moist air is more of a depressant, producing quiet sleep and slower circulation of the blood."

How much sleepier the residents of the Atlantic seaboard must be than those of New Mexico or southern Arizona!

Dr. W. A. Evans, in an essay on "Standards of Ventilation," writes: "If air is too dry it desiccates mucous membranes; hence it determines infections." Yet do we not send patients to such dry climates as those of Arizona or Egypt to get rid of chronic catarrh?

The question of relative humidity is not so easily disposed of. Alternating high and low humidities in time may irritate the respiratory mucous membranes, but atmospheric humidity should not be regarded as the sole or most important criterion in determining the fitness of the air to breathe in a schoolroom or hospital. Superheated or canned air, remoistened to the desired humidity of 60%, stagnating in a ward or schoolroom, where it is rebreathed many times, may conform to all the physical standards of perfection, yet the pupils or patients may continue to grow ane-

mic, lose appetite and strength and suffer from headache and other nervous disorders until some humanitarian turns off the patent air washer or humidifier in the basement, opens the windows to admit fresh, free-flowing outdoor air, and lets Nature take care of the humidity!

Humidity, moreover, acts more strongly upon the outer surface of the body than upon the ultimate respiratory interchange in the lungs, for upon the moisture and temperature of the air depend the other physiological processes of radiation and convection of body heat and stimulation of the cutaneous vasomotor nerves, processes quite apart from the mechanism of respiration, though often confounded with it in discussions on the fitness of the respired air.

It is a pleasure to note the reaction which is already taking place in regard to hygrometry. In the issue of THE HEATING AND VENTILATING MAGAZINE for December, 1911, Rosenau and Amos conclude that "there has recently been a growing tendency to regard the ill-effects of vitiated air as due to the increased temperature and moisture, but it is now apparent that there are other factors which must be taken into account."

**IV—Personal "Comfort"**

A fourth common fallacy is the reference to the feeling of personal "comfort" to determine the fitness of respired air. Nothing could be more misleading, and it is precisely this feeling of "comfort" which makes it so difficult for many persons to tolerate open windows. For example, J. J. Lyle, in a paper on "Relative Humidity: Its Effect on Comfort and Health," states that "the author's testimony is that he is much more comfortable with a moderate humidity than a low one, unless he resorts to overheating." While this is true, it has little to do with determining the fitness of an atmosphere for breathing, yet many authors assume that a sensation of comfort is a reliable guide. In reality, this sensation depends upon many factors. Certain deleterious atmospheres are highly uncomfortable, others are not so in the least. Relative humidity, the moisture or dryness of the body surface and of the clothing, the motion of the air and its temperature, all enter into the relative comfort of the individual. Shortly after eating a heavy meal, one may be uncomfortably cold in the same atmosphere in which he later becomes comfortable, owing to the deflection of blood from the surface of the body to the viscera during digestion. Ill health and feeble circulation, age and many other factors affect the sensation of comfort in different atmospheres.

I recently attended a meeting of heating and ventilating engineers in a large room subject to the modern system of closed ventilation. The audience had been already assembled for an hour, and the room was full of their exhalations and tobacco smoke. On entering it, with several others, we commented on the extreme discomfort of the atmosphere, yet the audience was "comfortable" and we soon became as comfortable after becoming accustomed to the vitiated air. A man in my clinic in Bellevue Hospital was admitted in coma from accidental gas poisoning. When he recovered, I asked him particularly about his initial sensations. He had not been in the least "uncomfortable" in an atmosphere charged with gas, in which he lay down and calmly went to sleep. I have seen many such patients but recall none who was "uncomfortable," excepting as the odor of escaping gas is disagreeable to most persons.

This sensation, therefore, is a dangerous index of proper ventilation, being, in many cases, referable to cutaneous vasomotor and sensory conditions wholly apart from the mechanism of respiration.

**V—Tests Often Too Short**

A fifth fallacy is that ventilation experiments are often conducted through too short a period. Atmospheric conditions to which one is subjected for a few hours, as in large audience halls, may appear ideal when stated in terms of air renewal, temperature, air motion, humidity and

other physical terms, which might easily prove harmful if, as in the case of the hospital patient or school child, the organism was subjected to such conditons for consecutive days or weeks.

Having had considerable experience in studying the effects upon patients of different kinds of ventilation, I am convinced that there is only one rational way to ventilate a hospital ward, and that is with windows that may be opened at all times, using steam or hoter water radiators, except in such climates as permit the substitution of open fires, as in England. My conviction on this point is derived mainly from service in three large metropolitan hospitals originally furnished with most elaborate systems of mechanical ventilation, in each of which the open window plan has been substituted to a greater or less extent; in one completely, because heat could be derived independent of air supply, and in the others partially, because the fatal error was made of supplying both together. In the hospital last built, of this series, the architects insisted upon installing a costly closed system of ventilation, despite the earnest protests of the Medical Board. A compromise was effected, however, between mechanical fans and suction apparatus, on the one hand, and steam radiators near windows, on the other. After a fair trial, the "system" was completely abandoned, the windows are kept open all the year round and the hospital trustees, in planning a second large pavilion, have refused to let the architects install the "system" again.

It is curious how little credit is given to the experience of those who live and work in school rooms and wards by those whose knowledge of ventilation is based upon mathematical calculations without acquaintance with the most elementary phenomena of respiration. One is told that "patients will object to drafts," that "they will be too cold," that "open windows will make winter heating too costly," etc. The best ventilated wards I ever worked in, through many years, are those in the original Bellevue Hospitay, New York, built 90 years ago for a poorhouse, with wide windows on three sides reaching to the floor, and now using steam radiators. As for forced drafts, humidifiers and thermometers, we were fortunately spared their existence and, if a little snow sometimes drifted in through the open windows, no one was ever the worse for it.

### VI—Windows

Ward and school room windows should always be of the "casement" type, with horizontal transoms above, and there should be transoms over the doors. This admits of opening them in a variety of ways, according to the weather. Sash windows are often made so heavy that nurses cannot easily raise them and, consequently, do not. In the hospitals of continental Europe, one sees no other type than the casement. If the heaters are placed near the windows, the entering air is sufficiently warmed without ever being roasted or deprived of its natural invigorating properties.

For use in warmer weather, a few common electric fans at the ends of the ward add to the natural air currents. A few straight flues reaching from the floor of the ward to the roof of the building also promote air currents.

There is no better way to ventilate a cow barn, for example, and a gas jet, set in the flue, practically converts it into a fireplace chimney which, everyone knows, is an admirable ventilator.

There should be definite rules for nurses and teachers up to a certain point, but not such rules as admit of no exercise of discretion. Ward windows should be opened wide after the morning stools and after the close of the visiting hours when, in special cases, patients may be covered with extra blankets for a few moments. Teachers should see to it that the windows are wide open at recess and that the classroom is thoroughly aired at night. House engineers expect directions as to temperature, but should be made to understand that absolute uniformity, especially in a hospital, is most undesirable, as explained above.

The most common objection made to window ventilation of wards is that patients will "take cold in the drafts." I can only say that I have never heard this objection seriously entertained by physicans or nurses, but only by those whose acquaintance with the matter is purely theoretical. I have also had many letters from school teachers complaining that they were never permitted to open the classroom windows by rules of trustees who rarely, if ever, enter the rooms themselves.

**VII—Conclusions**

1. The physiological tests of the fitness of air for breathing are far more important than the physical tests.

2. The value of closed ventilation systems ceases wherever open windows may be made available.

3. In hospital wards and school rooms, casement windows with transoms, and steam or hot water radiators, furnish all the essential elements for the best possible ventilation in this climate, supplemented, if need be, by suction fans or exit flues.

4. Canned air, i. e., greatly superheated air, loses properties which are most essential for the hospital patient or growing child.

5. The thermostat is a harmful instrument in that it encourages reliance on artificial or mechanical systems of ventilation.

6. The relative humidity of the air constitutes only one factor in its fitness, being much less important than air purity.

7. Thermometric records are fallacious guides to ventilation, and absolute uniformity of record is unphysiological and undesirable.

8. Statements as to the frequent "complete renewal" of air in a ward by mechanical means are fallacious for physical reasons.

9. Personal "comfort" is a wholly misleading guide as to the fitness of air for breathing.

10. Blood pressure and metabolism experiments in fresh versus foul air are yielding very striking results and should be prosecuted extensively as the only thoroughly scientific tests of the fitness of a given atmosphere for the organism, especially when taken in connection with blood examinations and symptoms.

11. Hasty conclusions are often drawn from brief periods of observation, whereas longer observation may yield opposite results.

12. It is highly probable that the existing physical apparatus for testing the qualities of the air fail to reveal its most important property; namely, that which everyone recognizes through his own respiratory mechanism, under the vague name of "freshness."

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# The Time Required to Heat Large Buildings to Normal Temperature

By PETER L. TEA, E. E.

*(Concluded from May issue.)*

ERRATA.—In Formula 5 the specific heat of air should be indicated by a capital S instead of a small s, so as not to confuse with the small s in Formula 4. This correction applies wherever the combination VSd appears in the formulas that follow.

Page 20—For "for every cubic foot VSd = 1 approximately," read "for every 50 cu. ft. VSd = 1 approximately"

Formula 7 should read $V' = V\ (1+\alpha t)$.

II.

Table 2 refers to the problem considered in Section 1 and is self-explanatory in the light of the discussion given in Section 1.

The total per cent. added over the transmission figures is

$$100\left(\frac{74500}{56600}-1\right)=31.5\%$$

The values of a, b, c are found as follows:

| | | | |
|---|---|---|---|
| a | (225—70) = 74500 | $\therefore a = 480$ |
| b | 70 = 19200 | $\therefore b = 275$ |
| c | 70 = 37400 | $\therefore c = 535$ |
| | | $\therefore s = b + c = 810$ |

TABLE 2.

| Room. | Exposure. | B. T. U. transmitted per hour. | Per cent. added. | B. T. U. per hour. | Radiation factor. | Square feet. radiating surface. |
|---|---|---|---|---|---|---|
| | N | 20270 | 35 | 27400 | 1/250 | 110 |
| | W | 16060 | 35 | 21700 | 1/250 | 87 |
| | S | 20270 | 25 | 25400 | 1/250 | 102 |
| | Total.. | 56600 | | Total.. | 74500 | |

The coefficient a refers to the heating surface, b to the brick wall surface and c to the window surface.

The volume of the room is

$$29 \times 24 \times 14 = 9750 \text{ cu. ft.}$$

The time in hours required to bring up the room temperature from 0° F. to 70° F., no air leakage considered, is from (16)

$$t = \frac{\frac{9750}{50}}{810\,(1+0.45\times 1.315)} \log_e \frac{1.45\times 1.315}{0.315}$$

$$= 0.272 \text{ hrs.}$$

Using formula (6) the following table is calculated:

| t in hours | $T_a$ in ° F. |
|---|---|
| 0 | 0 |
| .082 | 35 |
| .272 | 70 |
| ∞ | 83.8 |

from which values curve No. 1 was plotted.

WHEN THE LEAKAGE AIR IS BY NATURAL VENTILATION.

Consider the case of leakage air, by natural ventilation, in same room. In order that $T_a = 70°$ F for $t = \infty$ we must have from (13)

$$R - 1 - \frac{2\,V\,S\,a\,d}{s} = 0$$

i. e.
$$0.315 - \frac{2\times 195\times a}{810} = 0$$

for which $a = 0.655$

i. e., the air in the room can change 0.655 times per hour for the extreme case of $T_a = T_o = 0°$ F. at start and $T_a$ will approach 70° F. nearer and nearer.

Assuming that the minimum possible leakage is $a = 0.25$; then

$$t = \frac{195}{810\,(1+0.45\times 1.315)+2\times 195\times 0.25} \log_e \frac{1.45\times 1.315}{0.315 - \frac{2\times 195\times 0.25}{810}}$$

$$= 0.322 \text{ hrs.}$$

After the 70° temp. is reached we have 74500—56600 = 17900 B. T. U. per hour available in excess of what we need, if there were no leakage. The temperature regulator will maintain 70° F. if we do not use the excess. The excess can heat x cu. ft. of 0° air to 70°, per hour.

$$\frac{x}{50} \times 70 = 17900$$

$$\therefore x = 12800 \text{ cu. ft.}$$

Of the heat which goes to leakage air, half goes out in the warm air and half goes to heat the same volume of cold air entering, hence only half of 12,800 cu. ft. per hour will be the permissible leakage of cold air in.

THERMAL CAPACITY OF WALLS.

It is possible to include the thermal capacity of the walls in the above discussion. Assume that the exposed walls are heated to an average temperature

$$\tfrac{1}{2}\,(T_a - T_o)$$

the rate of wall heating or cooling; i. e., the B. T. U. per hour retained or lost by the wall will be

$$MS_1 \frac{d}{dt} \tfrac{1}{2}\,(T_a - T_o) = \tfrac{1}{2}\,MS_1 \frac{dT_a}{dt}$$

where M = mass of exposed wall.

$S_1$ = specific heat of exposed wall.

The introduction of this new factor simply serves to increase the other

thermal capacity quantity VSd; i. e., the air by an amount $c = \frac{1}{2} MS_1$.

Any non-exposed wall or any interior object which has appreciable thermal capacity could be considered in the same manner except that the factor ½ would become unity.

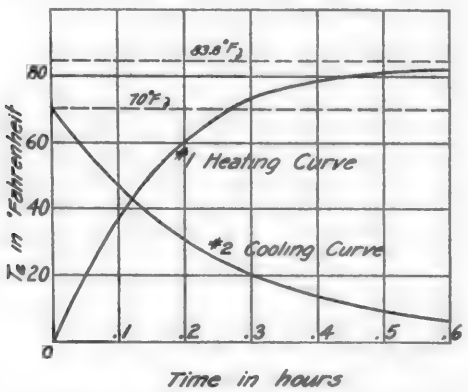


FIG. 3. HEATING CURVES FOR INTERIOR SHOWN IN FIG. 2. R = 1.315 FOR NO LEAKAGE, THERMAL CAPACITY OF WALLS NOT CONSIDERED.

Referring to Fig. 2, the total exposed wall volume is 835 cu. ft. Assuming the floor and ceiling to be of the specific heat of brick, the total volume of floor and ceiling, including the east wall, is 1875 cu. ft. The specific heat of brick is 0.2 and the weight is 100 lbs. per cubic foot. We need consider only half of the unexposed wall, ceiling and floor, inasmuch as the adjacent interiors will take care of half. Thus the total thermal capacity of the brick material will be $\frac{1}{2}(835 + 1875) \times 100 \times 0.2 = 27{,}100$.

The temperature of the wall at the surface inside the interior corresponds readily to the increase in internal temperature, while near the center of the wall the temperature will lag behind, so that the temperature will not be as in Fig. 1, but will be convex downward.

Thus the average temperature of the wall while heating, will be less than $\frac{1}{2}(T_a - T_o)$. In cooling the reverse obtains. So that the walls act as an inertia, or as an inductance in an electrical circuit, preventing the interior from heating and cooling as fast as it otherwise would.

We will take the average temperature as $\frac{1}{4}(T_a - T_o)$, thus the thermal capacity total will be

$$195 + 13550.$$

In order to indicate the effect of the thermal capacity of the walls, the curves in Figs. 4 and 5 were calculated. A very interesting account of the temperature conditions in walls while heating and cooling will be found in the book by Dietz, "Ventilations und Heizungs—Anlagen," pp. 242-249.

The curves in Fig. 6 indicate the relation between the time required to reach 70° F. for the interior shown in Fig. 2 for various values of the leakage.

III.

The expression for cooling of the interior can be obtained in a manner similar to the method used for obtaining the expression for heating. For no leakage,

$$VSd \frac{d\,T_s}{d\,t} = -s\,(T_s - T_o) \qquad (18)$$

whence

$$t = \frac{VSd}{s} \log_e \frac{T - T_o}{T_a - T_o}$$

where T = temperature of room

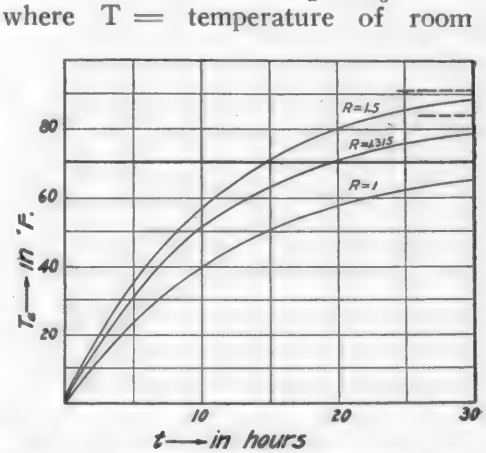


FIG. 4. HEATING CURVES FIGURED FOR INTERIOR SHOWN IN FIG. 2 FOR VARIOUS VALUES OF R, WITH ZERO LEAKAGE, THERMAL CAPACITY OF WALLS CONSIDERED.

when, with radiators shut off, the time is taken as zero.

$T_a$ = temperature of room at any time t.

For leakage ventilation the expression is

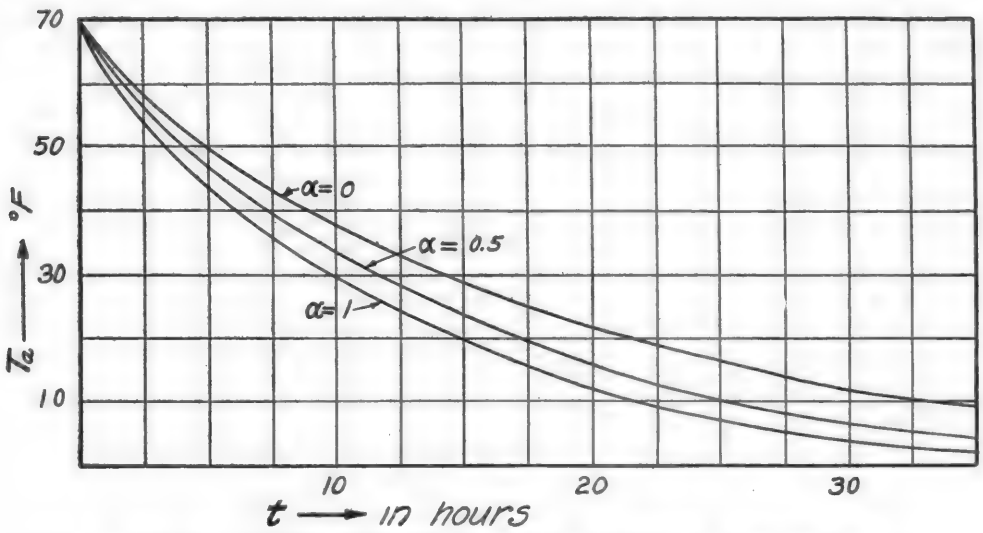


FIG. 5. COOLING CURVES, SHOWING RELATION BETWEEN TEMPERATURE, $T_a$, OF THE INTERIOR FIG. 2, AND THE TIME, t, IN HOURS, FOR VARIOUS VALUES OF LEAKAGE.

$$t = \frac{VSd}{s + 2VS\alpha d} \log_e \frac{T - T_o}{T_a - T_o} \qquad (19)$$

For the first problem considered (Fig. 2), the following values were calculated, for no leakage:

| $T_a$ in ° F. | t in hours |
|---|---|
| 70 | 0 |
| 35 | .0167 |
| 20 | .302 |
| 10 | .47 |
| 0 | ∞ |

These values are plotted as curve No. 2 (Fig. 3). The thermal capacity of the walls is considered in Fig. 5.

**Conclusions.**

It is seen how important a part volume and leakage of cold air play in the heating of buildings. The ideal heating layout would be the one in which the normal temperature is reached throughout in the same time.

The method given in this paper is intended to help in the approximate realization of this condition by enabling the percentage to be added over and above the transmission figures to be calculated for unusual conditions of interiors of large ratio of volume to exposed surface and given construction, so that a normal temperature will be reached in a given time.

It is unnecessary to mention that the results cannot be predicted with extreme accuracy, mainly because the amount of cold air leakage cannot be estimated accurately. This leakage is composed of two parts: first, that which is due to cold air coming in and warm air going out through cracks, crevices and in general all non-airtight joints, and, second, the inflow and outflow of air through the permeable walls. If the neutral zone of the interior is between the floor and the ceiling (the neutral zone is the plane in which the pressure is equal to the external pressure) then there will be an outflow of warm air above this point and an inflow of cold air below, if the interior is heated, since above the neutral zone there will exist a positive pressure, and below a negative pressure. The reverse conditions will obtain in the case of refrigerating

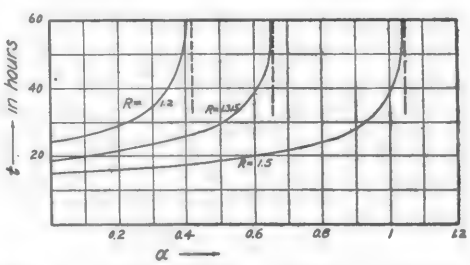


FIG. 6. CURVES FOR VARIOUS VALUES OF R, SHOWING RELATION BETWEEN TIME, IN HOURS, TO REACH $T_a$ = 70° F. FROM $T_a = T_o = 0°$ F. AND THE LEAKAGE COEFFICIENT $\alpha$. THERMAL CAPACITY OF WALLS CONSIDERED, FOR INTERIOR FIG. 2.

interiors, and our method is applicable in predicting the time and temperature conditions for such interiors as well.

In very tall buildings the high column of heated air, communicating all the way up through elevator shafts and stairways, acts like a veritable chimney and produces a strong draft, the cold air leaking in at the lower floors and the warm air leaking out at the upper floors. Since the difference in pressure, internal and external, of the air is linear with re-

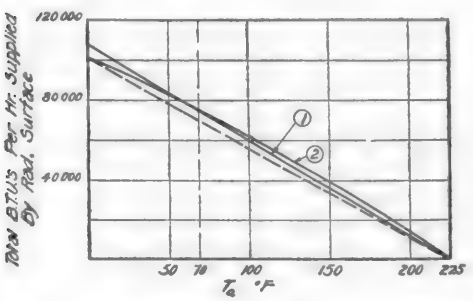


FIG. 7. HEAT EMITTED FROM RADIATORS AT DIFFERENT ROOM TEMPERATURES, ACCORDING TO PECLET'S AND NEWTON'S LAWS.

spect to the height, the percentage added should be high on the lowest floor and decrease linearly going up.

Undoubtedly future study and application of the theory of the neutral zone in heating will enable the amount of leakage to be determined, at least between upper and lower limits.

Another point: Péclet showed that if the constant used with Newton's formula be determined experimentally for a hot body giving up heat to air by the three ways—

1. Radiation
2. Conduction
3. Convection

the rate of heat given off is larger than calculated by Newton's law with that constant if the body temperature is considerably increased.

Péclet showed that the following form was more in accord with experiment:

$$\frac{dH}{dt} = m\left(a^{T_s} - a^{T_a}\right)$$

where $a = 1.00196$.

$T_s$ = steam temp. deg. F above 32°.

$T_a$ = air temp. deg. F. above 32°.

m = constant.

Carpenter mentions in his book on "Heating and Ventilating of Buildings," that Péclet's law has been found to agree with tests on radiators. Assuming that the law as given above is correct for radiators, and includes all three factors in heat transmission, the constant m was calculated for the total heating surface considered in the problem of Fig. 2 and Curve 2 plotted (Fig. 7), between $\frac{dH}{dt}$ and $T_a$. The same was done for Newton's law Curve 1 (Fig. 7). It is seen that from $T_a$=0° F. to 70° F. we credit the radiating surface, if we use Newton's law, with more heat than it gives, according to Péclet's law. By calculating our value of Newton's coefficient; i. e., 250 B. T. U. per hour per square foot radiating surface times the total radiating surface divided by 70 in our case, for the dotted line in Fig. 7 we could be on the safe side in using our formulas.

Of course we need not assume Péclet's law; we can actually determine experimentally the curve for radiators for $T_a$ between 0° F. and 70° F. and get our coefficient corresponding to dotted straight line (Fig. 7).

**Jobbers' Associations to Amalgamate.**

Action was taken at the meeting of the National Association of Jobbers of Plumbing Supplies at Atlantic City last month, providing for the consolidation of the National Association of Jobbers of Wrought Iron Pipe and Fittings and the National Association of Jobbers of Plumbing Supplies.

The new organization will be known as the National Pipe and Supplies Association. It proposed to make the next convention, which will be held in Chicago, a three-day meeting, with separate days for the interests of the pipe men, the steam goods dealers and the plumbing supply men. Special committees have been appointed by each association to arrange the details of the amalgamation. The new organization will have a president, two vice presidents, treasurer, and executive committee composed of the officers and four representatives from each industry.

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WHEN the National Association of Master Plumbers and Steam Fitters of Canada changed its title, last year, to the Canadian Society of Sanitary and Heating Engineers, we expressed the opinion while the proposed change was under discussion, that such a move was likely to introduce an entirely unnecessary confusion in the commonly accepted definition of the term, "heating engineer." This organization now proposes a further change in its title to that of the Canadian Society of Domestic Sanitary and Heating Engineers." The insertion of the word "Domestic" seems to us to be a very happy solution of the question; it woud be even more so if the title could read "Canadian Society of Domestic Heating and Sanitary Engineers." Such a title would accurately define the class of work done by most men who are both heating and plumbing contractors, and at the same time would be dignified, as befits the growing importance of these two industries.

THIS seems to be a time for adjustment of trade association titles, one of the latest being the merging of the National Association of Jobbers of Plumbing Supplies and the National Association of Jobbers of Wrought Iron Pipe and Fittings into the "National Pipe and Supplies Association," This action suggests, at least, the thought as to whether the steamfitting and plumbing trades are not drawing towards a closer affiliation in practice, if not in theory; that is to say, from the contractors' standpoint, if not from that of the designing engineer.

Such a view of the trend of affairs is certainly held by the American Federation of Labor which is at the present time standing sponsor for a determined effort on the part of the United Association of Journeymen Plumbers to disrupt and absorb the International Association of Steam, Hot Water and Power Pipe Fitters and Helpers of America. A strike based on this proposition, now under way in St. Louis, marks the opening battle following the declaration of war pronounced on the steam fitters' organization at the last convention of the American Federation of Labor. From many parts of the country come reports of the bitterness with which the journeymen steam fitters are being harried by the journeyman plumbers, and which will undoubtedly lead up to situations in the larger cities similar to those existing in Chicago last summer. It may well be asked how such changes as these would affect the status of the master fitters and plumbers in their association work.

NATIONAL ASSOCIATION OF MASTER STEAM AND HOT WATER FITTERS

WHO HELPS ME I HELP

## Programme for Twenty-Fourth Annual Convention, at Atlantic City, June 10-13, 1912

The plans announced for the business sessions of the twenty-fourth annual convention of the National Association of Master Steam and Hot Water Fitters, at Atlantic City, June 10-13, 1912, and for the entertainment of the association's members and guests, make up a programme full of interest and pleasure for all who will be so fortunate as to be numbered among those present. Following the precedent established last year at Chicago, this year's meeting will be an "open convention," the privileges of the floor being given to all in attendance to present and discuss matters of interest to the master fitter; the executive sessions will be confined to matters relating directly to organization matters.

MONDAY, JUNE 10.

During the gathering of the clans, the Eastern Trade Golf Association will hold a special all-day tournament on the links of the Atlantic City Country Club. The players will leave the St. Charles Hotel accompanied by the tournament committee at 9 A. M. and proceed by trolley to the links. The programme for this meet includes a team match between representatives of the master fitters and of the supply trade.

On the same day, meetings will be held of the board of directors of the steam fitters' association and of the Committee on Trade Relations, and, probably, of the Committee on Standardization.

TUESDAY, JUNE 11.

The first regular session of the convention will be held Tuesday morning. This will be followed by an afternoon session.

Immediately after the morning session, at about noon, there will be a meeting of the Manufacturers' and Supplymen's Entertainment Committee in a room adjoining the convention hall. Here the details of the entertainment plans will be arranged and committees appointed to carry them out.

In the evening a team rifle match is scheduled between the master fitters and supply men, with five men on each team.

WEDNESDAY, JUNE 12.

During the business session Wednesday morning a trip for the ladies has been arranged with the Atlantic City Country Club as the objective point. Luncheon will be served at the clubhouse and the return trip made so as to arrive at the St. Charles by 2 p. m., in time for the taking of the convention photograph.

In the evening the festivities will commence with bowling tournaments for the men and ladies at Sweeney's alleys. Immediately following these tournaments the party will adjourn to the Isleworth where the convention dinner will be served. As usual this will mark the climax of the entertainment programme, and under the direction of President W. G. LeCompte of the Manufacturers' and Supplymen's Entertainment Committee, this event may be depended upon to measure up fully to past standards for this occasion. The dinner will close with the distribution of prizes won at the golf tournament, rifle match and bowling tournaments.

THURSDAY, JUNE 13.

Thursday will be devoted to an all-day outing for the members and guests. The party will go by trolley cars to Longport and thence by boat to Ocean City. Returning by another route, the ride will be made by trolley all the way, taking the party past the Atlantic City Country Club. The trolleys will continue through Atlantic City to the Inlet where a shore dinner will be served at the Inlet Hotel at 1 P. M.

This event will bring the convention to a close.

### Manufacturers Opposed to the "1912 U. S. Standard" for Flanges and Flanged Fittings.

Under the heading of an "Important Notice to Engineers, Steamfitters, Contractors and Users of Valves and Fittings," the Manufacturers' Standardization Committee has issued a notice, under date of May 20, 1912, which is presented in full herewith:

"Do not specify nor order flanged fittings to the so-called '1912 U. S. Standard for Standard Weight and Extra Heavy Flanges and Flanger Fittings' as adopted by the National Association of Master Steam and Hot Water Fitters because this standard has not been accepted as final by the manu-

facturers of flanged fittings and valves, and will not be accepted until certain necessary revisions have been made to suit the practical requirements of all concerned.

"We have carefully examined and compared this standard with the one now in use by the leading manufacturers of flanged fittings and feel quite satisfied that it is not by any means final, as all the interests which should be considered, *i. e.*, the manufacturers and users, have not arrived at an agreement regarding the adoption of this standard. Before a new standard which deviates from the generally accepted practice for flanges and flanged fittings can be considered final, a number of important points must be carefully considered.

"It is a fact, though sometimes not understood, that there has been for some time a Manufacturers' Standard for Flanges and Flanged Fittings which has been adopted by the leading manufacturers. This standard is the result of many years of experience on the part of the manufacturers, engineers and large consumers. The length of time this standard has been in use and the enormous quantity of goods made in accordance with it and installed in power plants throughout the length and breadth of the United States have not been fully realized. Any new standard to replace the existing one should necessarily make as few changes as possible, and then only where experience has proven the change absolutely necessary.

"A committee consisting of representatives of the various manufacturers has already compiled a proposed standard, bearing in mind all the considerations mentioned herein, and the boltings which they have suggested compare very favorably with the table of dimensions on the Standard for High Pressure Lines issued by the Society of German Engineers in 100, also the report issued by the Engineering Standards Committee on British Standard Tables of Pipe Flanges. These two standards are designed for working pressures higher than 250 lbs., as well as for Continental practice in superheated steam, which is probably higher than prevails at present in the United States.

"While we realize that the '1912 U. S. Standard' was the result of careful consideration, yet we believe that its adoption by the National Association of Master Steam and Hot Water Fitters was very unfortunate. In this respect practically all the manufacturers of flanged fittings in the United States are of the same opinion, and the Committee of Manufacturers has presented its Proposed Standard in a preliminary way to the Committee of both the American Society of Mechanical Engineers and the National Association of Masteh Steam and Hot Water Fitters.

"In view of all these considerations it is better to maintain for the present the old practice, until a universal standard can be agreed upon."

The chairman of the committee, whose headquarters are at 30 Church St., New York, is Carlisle Mason, and the secretary, W. H. Douglas. The list of members includes the following:

| | |
|---|---|
| Jarecki Manufacturing Co., | Erie, Pa. |
| The Kelly & Jones Co., | New York, N. Y. |
| Walworth Manufacturing Co., | Boston, Mass. |
| McNab & Harlin Mfg. Co., | New York, N. Y. |
| Kuhns Bros., | Dayton, Ohio |
| Malleable Iron Fittings Co., | Branford, Conn. |
| Thomas Devlin Mfg. Co., | Philadelphia, Pa. |
| Nelson Valve Company, | Philadelphia, Pa. |
| Morse Iron Works, | Erie, Pa. |
| Detroit Brass Works, | Detroit, Mich. |
| Darling Pump & Mfg. Co., Ltd., | Williamsport, Pa. |
| The Newbury Mfg. Co., | Monroe, N. Y. |
| Ravena Iron Co., | Ravena, N. Y. |
| Stockham Pipe & Fittings Co., | Birmingham, Ala. |
| Crane Co., | Chicago, Ill. |
| Pittsburgh Valve & Fittings Co., | Barberton, Ohio |
| The Pratt & Cady Co., | Hartford, Conn. |
| Best Manufacturing Co., | Pittsburgh, Pa. |
| Jenkins Bros., | New York, N. Y. |
| American Valve Co., | Coxsackie, N. Y. |
| R. D. Wood & Co., | Philadelphia, Pa. |
| The Kennedy Valve Mfg. Co., | Elmira, N. Y. |
| The D. T. Williams Valve Co., | Cincinnati, Ohio |
| General Fire Extinguisher Co., | Providence, R. I. |
| Stanley G. Flagg & Co., | Philadelphia, Pa. |
| The A. P. Smith Mfg. Co., | East Orange, N. J. |
| A. Harvey's Sons Mfg. Co., Ltd., | Detroit, Mich. |
| The Chapman Valve Mfg. Co., | Indian Orchard, Mass. |
| Ludlor Valve Mfg. Co., | Troy, N. Y. |
| Norwood Engineering Co., | Florence, Mass. |
| Builders Iron Foundry, | Providence, R. I. |
| Eddy Valve Co., | Waterford, N. Y. |
| Essex Foundry, | New York, N. Y. |
| Benjamin F. Shaw Co., | Wilmington, Del. |
| The Fairbanks Company, | New York, N. Y. |
| T. McAvity & Sons, Ltd., | St. John, N. B. |
| The Lunkenheimer Company, | Cincinnati, Ohio |
| The Direct Separator Co., | Syracuse, N. Y. |
| The Kerr Engine Co., Ltd., | Walkerville, Ont. |
| Roe Stephens Mfg. Co., | Detroit, Mich. |
| Lumsden & VanStone, | Boston, Mass. |
| The M. W. Kellogg Co., | New York, N. Y. |
| American Foundry & Construction Co., | Pittsburgh, Pa. |
| Oil Well Supply Co., | Pittsburgh, Pa. |
| The Monarch Valve & Mfg. Co., | Springfield, Mass. |
| Pittsburgh Valve Foundry & Construction Co., | Pittsburgh, Pa. |
| H. J. Kaltenthaler, | Philadelphia, Pa. |
| Canada Foundry Co., Ltd., | Toronto, Ont. |

## National District Heating Association's Fourth Annual Convention at Detroit, June 25-28, 1912

A programme that will fully occupy the time of the delegates and guests has been prepared for the fourth annual convention of the National District Heating Association at Detroit, Mich., June 25-27, 1912. Two sessions are scheduled for each day.

The opening session will be held at the Cadillac Hotel, Tuesday morning, June 25, at 10 A. M., when addresses of welcome will be made by the Mayor of Detroit and by Alexander Dow, of the Edison Illuminating Co. Past President George W. Wright will respond on behalf of the association. President A. D. Spencer of Detroit will then deliver his address, and this will be followed by the reading of the report of the executive committee, George W. Wright, chairman; and of the report of Secretary-treasurer D. L. Gaskill.

Tuesday afternoon's session will be

opened with a report of the meter committee, F. C. Chambers, chairman. This will be followed by the reading of two papers, as announced in the detailed programme published in the May issue of THE HEATING AND VENTILATING MAGAZINE.

Wednesday morning the new officers will be nominated and elected, to be followed by committee reports, one by the committee on rates, R. D. DeWolf, chairman; and the other by the committee on central station records, H. R. Wetherell, chairman. The remainder of this session as well as the Wednesday afternoon and Thursday sessions will be given over to the reading and discussion of papers, there being no fewer than nine engineering papers on the programme. The Wednesday afternoon session, it should be noted, will be held on shipboard in connection with a trip to the Flats.

The closing session on Thursday afternoon will include a symposium by a number of manufacturers of underground insulation on descriptions of such insulation.

As previously announced, the entertainment programme will include an automobile ride for the ladies Tuesday afternoon, to be followed by a theatre party for all in the evening at the Temple Theatre. Wednesday afternoon will be given over to the boat trip to the Flats, the afternoon session being held en route. Supper will be served at the Flats. On Thursday morning, a card party has been arranged for the ladies.

The entertainment committee will be composed of the following; all located in Detroit:

J. F. Lewis, Murphy Heating Co., chairman; J. V. Redfield, manager Central Station Steam Co.; J. T. Bordley, Central Station Steam Co.; R. J. Kerchner, General Electric Co.; H. F. Van Valkenburgh, American Radiator Co.; R. W. Symes, Central Heating Co.; A. P. Briggs, General Heating Co.; F. W. Herendeen, United States Radiator Corporation; W. M. Moore, Buckeye Chemical Co.; and E. E. McNair, United States Radiator Corporation.

Elaborate arrangements have been made for carrying out the details of the entertainment, $1,000.00 having been appropriated for this purpose.

## *Annual Meeting of the Federal Furnace League*

Advertising as the vital question confronting furnace manufacturers in furthering the cause of scientific warm air furnace heating was the keynote of the fifth annual convention of the Federal Furnace League, held in Detroit, May 6. The method of conducting such a campaign with a view of bringing home to the consumer the advantages of warm air furnace heating when properly designed and installed was described at length by Howard A. Studley, of the Frank Presbrey Advertising Co.

A general sentiment was expressed by Vice-President Glessner when he stated that the work done by the engineering department of the league had accomplished the preliminary work for a broad forward movement in the interests of furnace heating.

The report of the secretary and engineer, Dr. William F. Colbert, was an exhaustive summary of the work done by the league during the year and contained also many suggestions as a basis for future efforts. The principal portions of his report are given herewith:

REPORT OF SECRETARY-ENGINEER

The past year has probably been the crucial period in the history of the Federal Furnace League. Your officers have been severely handicapped by lack of adequate financial support, and have perforce concentrated all their time and energy with the limited funds available for the completion of the work inaugurated two years ago on the preparation, publishing and distribution of a standard book on furnace heating and ventilating, and the testing and rating of furnaces, on an accurate and impartial basis.

In the first place, tables, etc., in the book, and the book itself are intended as a reliable standard toward which the industry can work. It is not and has not been expected that every furnace heating contract in the United States for the year 1912 would be installed on the basis of the Federal System.

To the manufacturers of furnace pipe and fittings, and to the manufacturers of registers, we wish to announce that the standard sizes of furnace pipe and fittings, and the standard sizes of registers manufactured by them can be rated in accordance with the Federal System just as furnaces are rated, and that such rating by the league will carry with it the privilege of using the league's mark, etc., under similar conditions as those that now apply to the testing and rating and trade-marking of furnaces.

MISUNDERSTANDING AS TO LEAGUE'S OBJECTS

There has undoubtedly been grave misunderstanding of the attitude of the league toward the various methods of furnace installation upon which subject it would be well to dilate for a few moments.

The Federal Furnace League was organized to accomplish certain purposes, which may be summarized as follows:

1—To inform architects, builders, physicians and the public of the great practical and sanitary advantages of proper warm-air furnace heating and ventilating.

2—To elevate the standard warm-air furnace installation, and to this end to furnish to furnace dealers, architects and builders, complete rules and directions embodying the principals of correct furnace practice.

3—To educate the public to a knowledge of the necessity of pure air in their houses, which in winter can be secured at a reasonable cost only through the medium of the proper and adequate warm-air furnace heating plant with formal ventilation.

4—To co-operate with architects to make the inclusion of a formal system of ventilation the standard practice in planning residences and other buildings.

To which objects was added two years ago the following:

To test the furnaces of its members and to assign correct guaranteed capacity ratings to them.

Your secretary and engineer has always felt that the matter of publicity and furnace heating was of prime importance. No system of furnace installation can be of such great value for publicity purposes as a system which includes formal ventilation.

COMBINED INSIDE AND OUTSIDE AIR SUPPLY SYSTEM

I would remind those who have at various times objected to the stand taken by the league in favor of a furnace heating and ventilating system that the league has not at any time gone beyond stating and maintaining that this system is, all things considered, the most sanitary and the best method of furnace installation. It may be news to many here present that the active officers of the Federal Furnace League have for a long time considered the advisability of issuing material laying down a standard method for the combination of inside and outside-air supply in furnace heating systems, and that at one time there was serious discussion of the advisability of including such material in the book recently published. It was finally decided that it was not advisable to include such material in the present book, but that such material might properly be included in a separate book to be issued at a later date. Of course, the ratings on tested furnaces would apply to the combined inside and outside-air supply system when the book thereon is issued.

REASONS FOR SEPARATING TWO SYSTEMS

The reasons for separating the two systems of furnace installation and for temporarily withholding publication of material on the combined inside and outside-air supply system, I herewith submit to you:

First—The combined inside and outside-air supply system of furnace installation does not provide the best sort of material for a publicity campaign.

Second—The combined inside and outside-air supply system of furnace installation can be placed on a sound engineering basis, but there are some problems in connection with the method of handling the air supply that will require experimental work to definitely settle. Before any attempt is made to issue any standard information on this system of furnace installation a fool proof method of proportioning and combining the air supply must be worked out and demonstrated.

Third—The necessary expense and delay in securing the information required would be such that it would not be advisable to withhold the publication of the Federal System of Heating and Ventilation until this material was available.

Fourth—As information on combined inside and outside-air supply of furnace installation is not necessary to the prosecution of the most successful sort of a publicity campaign, and as the Federal System of Heating and Ventilation and the testing and rating of furnaces, etc., do have a bearing on this subject, the Federal System of Heating and Ventilation, etc., should be made available at the earliest possible date, so that its advantages for publicity purposes might be available should the furnace industry desire to advertise furnace heating.

The league during the year published 21,000 copies of the Federal System of Heating and Ventilation, of which 5,700 copies have been distributed to architects and consulting engineers. Many letters of congratulation from architects have been received, and the interest in possible refinements of furnace installations has been such that our office facilities have been taxed to take care of this correspondence.

PROGRESS OF TESTING FURNACES.

The work of testing and rating of furnaces has gone forward. During the year 88 furnaces have been rated by the league, making a total of 125 furnaces rated to date. The league has also conducted experimental tests for members on three furnaces, and, as a result of the testing and rating of furnaces, has been able to furnish valuable information to members whose furnaces have been tested and rated and who have asked for a report on their furnaces.

I also wish to report that the engineering department of the league to date has prepared 117 heating plans and specifications of which 62 were ordered and paid for by members.

OBSERVATIONS FROM TESTS MADE

As the engineer of the league I would advise you that observations at tests of furnaces warrant the following statements:

First—That it is possible to design furnaces so that air is delivered at practically even temperature at all points in the furnace bonnet. Some of the furnaces tested have shown variations of as much as 30° F. in temperature of air at various points in the bonnet, and as this weakness is notable in one very common type of furnace, the interests of the industry will be conserved by the elimination of this type of apparatus as rapidly as circumstances will permit.

Second—That the placing of barriers to

the upward flow of air over the heating surfaces of the furnace considerably reduces the efficiency and the durability of the furnace.

Third—That it is possible to so design direct heating surfaces in a furnace that it is very difficult to dake them red hot, thus adding to both durability and efficiency.

Fourth—That certain classes of furnaces while otherwise commendable do not have sufficient heating surface and as a result gases are discharged into the chimney at temperatures so high that they represent an absolute waste of fuel.

Fifth—That practically all the hot blast devices for soft coal furnaces admit excessive amounts of air to the combustion chamber actually injuring combustion and the efficiency of the furnace. Our experience warrants the statement that soft coal furnaces would give better results if a furnace without any hot blast or other devices, but with 50% to 100% larger grate area, were used.

Sixth—Spaces for gas travel in radiators are not proportioned to the capacity of the fire-box of the furnace and the volume of gases that are to travel through the radiator. In some cases radiators have had more than three times the required cross section area for gas travel. In a few cases the cross section area of radiators for gas travel has been insufficient. Similar variations are noted in size of smoke collar provided.

Seventh—Greater care should be exercised in the designing and formation of joints between various portions of the furnace.

Eighth—Many furnaces with large areas of heating surfaces have the heating surfaces so poorly placed as to seriously affect both the efficiency and durability of the apparatus. A better furnace could be built at a lower manufacturing cost.

Ninth—The prevalence of large uninsulated cast iron fronts and of uninsulated or poorly insulated furnace casings is prime evidence of the fact that furnace manufacturers do not have any conception of the absolute reduction in the capacity of their apparatus through the lack of proper insulation of casings. A furnace can be of meritorious design and construction, but if a large percentage of the heat is wasted through casings the amount of heat available for delivery into the rooms to be heated is reduced. It should be borne in mind that furnaces are intended to heat rooms, not cellars.

In summarizing, I would say that the furnace manufacturers should have long since given more attention to the matter of scientific furnace design. The average of all furnaces submitted for tests has been fair. The majority of the furnaces submitted for tests were very similar in cost, capacity and efficiency. Here and there a manufacturer has succeeded in designing an exceptionally good furnace according to present standards, but it must be thoroughly understood that no apparatus submitted for test even approaches the limits of present-day possibilities in furnace design.

The greatest need of the furnace industry is engineering knowledge applied to the designing, construction, rating and installation of furnaces. A perfectly designed furnace remains to be seen. We are patiently awaiting its arrival at the testing station.

### A PROPOSED PUBLICITY CAMPAIGN

In his address containing suggestions for a publicity campaign, Howard A. Studley stated:

Statistics for the past four years show that the percetange increase per year in furnace sales was 7½%, of heating boilers, 10½%. The comparative percentage increase, therefore, of boiler sales per year over furnace sales is 40%. This means to you that eventually boiler sales will so far outstrip furnace sales that it will become a serious menace to your industry. There is, therefore, no time so opportune as the present to begin some effectual action for furnace sales protection.

The principal advertising advantage you now have is your ability to concentrate the public mind on one point instead, of necessity, dwelling on generalities only. This condition has been brought about by the Federal Furnace League.

1st.—Through the preparation of a system of installation (properly protected by copyright).

2d.—Through the introduction of unbiased tests determining the capacities of furnaces.

3d.—Through the preparation of a trade mark capacity rating plate to be used on tested furnaces only.

4th.—Through the preparation of standard warm air furnace heating specifications and proposal blanks.

In our opinion, all that is necessary to win for tested furnaces relative popularity and to stimulate a demand for each brand is first to concentrate public attention on the facts regarding warm air heating, to focus the interest of the thousands of possible users on its advantages and to indelibly stamp on the mind of the public the Federal rating plate so that they will insist on seeing a furnace with that label when interested in purchasing.

The tests of furnaces mean that you can tell the ultimate consumer in advertising copy that when he demands of the dealer that his house be heated according to the advertised idea of furnace heating, the capacity of the furnace will assuredly be relative to the requirements of the building, without the consumer being at the mercy of one man's judgment only.

A publicity campaign will make the individual efforts of each manufacturer much easier than if you try to carry the weight of advertising separately, and will prepare the soil from year to vear for richer harvests for each of you.

The press of the entire country are de-

voting a great deal of space to the discussion of laws of health, and when you link this force with your products, your campaign will receive the added strength at no additional cost to you.

In summarizing the above advantages to you, I have not yet mentioned a most important point. The boiler manufacturers have spent hundreds of thousands of dollars to create in the mind of the consumer the impression that steam and hot water radiation heating systems are superior to all others.

Ordinary warm air furnace heating has been offered during the entire period covered by the publicity campaigns of boiler manufacturers. Ordinary furnace heating has been continuously and extensively attacked by them in advertising copy without any defense on your part.

At this late date an attempt to offer a defense for ordinary furnace heating would be an unnecessarily expensive proposition.

The material submitted to us for study from the standpoint of publicity specialists makes it possible for you to evade this issue. For publicity purposes it is more economical, results are more certain and will be obtained quicker by offering a new method of furnace installation that does away with all the objections to furnace heating that have heretofore been advanced by hot water and steam advocates.

It may be desirable from the purely commercial standpoint to use other methods of furnace installation, but as a basis for a publicity campaign the Federal System of Heating and Ventilation would seem most desirable.

A publicity campaign based on this premise would surely prove most economical.

Now that you have available such interesting and forceful material for a cooperative publicity campaign, good business dictates that you lose no time in making the most efficient use thereof.

NEW OFFICERS.

Officers were elected for the ensuing year as follows:

President, Frank Mixter, Rock Island Stove Co., Rock Island, Ill.

Vice-president, George A. Munson, Munson Heater Co., Connellsville, Pa.

Secretary-treasurer, Dr. William F. Colbert, Philadelphia.

Executive Committee—George H. Langenberg, Haynes - Langenberg Mfg. Company, St. Louis, Mo.; J. A. Howard, Est. P. D. Beckwith, Dowagiac, Mich.; R. H. Bradley, Kelsey Heating Co., Syracuse, N. Y.; W. P. Cooke, Monroe Foundry & Furnace Co., Monroe, Mich., and A. C. Mott, Abram Cox Stove Co., Philadelphia, Pa.

Dr. William F. Colbert was reappointed engineer for the league at a salary of $300 per month.

## AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

### Summer Meeting in Detroit.

The midsummer meeting of the American Society of Heating and Ventilating Engineers will be held in Detroit, Mich., on Thursday and Friday, July 11 and 12, 1912. Secretary W. W. Macon has sent out the following as suitable topics for discussion at this meeting, in addition to the papers to be presented:

1. Upward versus downward ventilation for the schoolroom.
2. Ventilation of motion picture theatres.
3. Ventilation of small factories.
4. Movement of air within rooms.
5. Effect of wind on building heat losses for different outside temperatures.
6. Heat emission of indirect gravity radiation.
7. Designs for drying various materials.
8. The present limitation of central station heating.
9. Efficiency of underground steam piping.
10. Forced hot water heating for buildings.
11. Design of exhauster system for removing shavings, industrial wastes, etc.
12. Distance between water chamber and eliminator in air washers.
13. Data on solid material collected by the air washer.
14. Air cooling for buildings.
15. Testing steam and hot water boilers.
16. Increased pressure devices in hot water heating.
17. Rating rediators.
18. Air spaces in direct radiators.
19. The name radiator as a misnomer.
20. Experiences with fractional radiator valve installations.
21. Securing humidity in direct radiation heating.
22. Temperature regulation in residence heating.
23. Testing warm air furnaces.
24. Vacuum cleaning installations and records.
25. Efficiency of labor element in the heating industry.

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A booklet intended to further the interests of the society, especially in the way of increasing its membership, has lately been issued from the society's headquarters in the Engineering Societies Building, 29 West 39th St., New York. The booklet contains illustrations of the building, including both exterior and interior views, showing the conveniences at the disposal of the members due to the location of the society's headquarters in this building. A brief review is given of the activities of

the heating engineers' society. Among these privileges are mentioned the opportunity to consult the library at any time, the advantage of having private dressing rooms, and accommodations in the society's own office for committee and other meetings.

### New York Chapter's Last Meeting for Season

A brilliant season for the lately-formed New York Chapter came to a close May 14 when a chapter dinner was given at Keen's Chop House, New York. The chapter was organized October 24, 1911, and it already has a membership of 73, more than half of whom were present at the dinner. It has held monthly meetings during the past winter and is responsible for the inauguration of some important movements for the benefit of the profession. One of the most important of these is in connection with the proposed new building code for New York City. One of the speakers, D. D. Kimball, stated that the proposed new code contained no provisions for the ventilation of buildings except by windows. Mr. Kimball compared this with the conditions in Chicago where the code not only provides for the proper ventilation of buildings but makes provision for a staff of inspectors to see that the law is carried out. It is not too late, Mr. Kimball added, to incorporate the desired requirements in the New York code. It was voted that the president appoint a committee to visit the code committee with a view of securing the desired requirements.

President Mackay afterward appointed as this committee D. D. Kimball, chairman; Frank T. Chapman and Frank K. Chew.

The diners were put in a proper spirit for the evening's entertainment by the singing of a special ode to the New York Chapter, entitled "N. Y. C." and sung to the tune of "Tammany." It was printed in a special souvenir folder gotten out by the chapter, containing a complete membership list, and ran as follows:

N. Y. C.—N. Y. C.
Ventilation is our boom.
Ozonation we'll have soon.
Every way, every day
We'll plug this game
And win some fame.
N. Y. C.

N. Y. C.—N. Y. C.
Legislation is our aim,
Microbes tremble at our name,
Albany, Albany,
We'll pass a law
Without a flaw
At Albany.

N. Y. C.—N. Y. C.
Laundried air is our delight,
B. t. u's know us by sight.
$CO_2$ $CO_2$
You're in the air
But we don't care.
N. Y. C.

President William M. Mackay introduced as the principal speaker of the evening Prof. William J. Baldwin, who entertained the diners with reminiscences of the trade of forty years ago.

"There was no HEATING AND VENTILATING MAGAZINES forty years ago," began Mr. Baldwin. "The pioneer men of the steam heating industry at that time were Joseph Nason, Walworth, Nason & Guile, Charles Gregg, Robert Briggs, the latter best known to-day through his formulas for pipe thread and fittings. It hot water work, John A. Scollav was a prominent figure, as was the Ellis concern on Centre Street, makers of the Ellis cast-iron hot water heating apparatus. Baker, Smith & Co. were doing a good business with the Baker Pullman hot water car heater. There was also George F. Blake and Stephen Geoghegan, a graduate of the firm of Hunter, Kellar & Co. and Hitchings & Co., on Wooster St.

"In those davs, Perkins and his hot water boiler for use with high pressure was active in the trade. I remember that Mr. Nason supposed the condensation from a steam boiler at ½ lb. pressure would not return to the boiler at any considerable pressure. At that time a broom stick in a mercury syphon was no uncommon form of steam gauge.

"Gold invented a one-pipe steam system. His radiators were made of Russia iron and his boiler was one of the first types of cast-iron heaters. Eight radiators in a house required eight tap holes in the top of the boiler. With this arrangement it was the practice to return the condensation to the boiler if the mains were not too long. Later the one-pipe system was discarded and disappeared for 20 years.

"It was not until 1868 that the trade discovered that condensation could be returned against any pressure. In those days the equalization of pressures was not considered. The column of water in the return pipe had to balance the pressure of steam in the flow pipe. A pressure of 40 lbs. was common but 60 lbs. was the limit.

"By 1880 the big New York buildings commenced to use exhaust steam for heating. The exhaust steam was sent through a coil in the smoke flue and there superheated to make it light and enable it to overcome friction.

"Reducing valves were a novelty in 1870 and were not in general use until 1880, at least for heating purposes. In 1872 it was a novelty to use live and exhaust steam for heating. Grease separators were unknown and with tallow used in the engines, there were no means of purifying the steam. In 1859-1860 fittings were still tapped by hand.

"Charles Gregg was the leader in installing high pressure work. Baker, Smith & Co. made a brass coil and used it at one time for heating until they perfected a return bend radiator.

"George F. Blake first returned steam at

high pressures. He used a 1-in. supply pipe to the radiator and a ⅜-in. return. The pressure would not follow the water down so he had to have a small return pipe for each radiator. The custom was to run the main pipe too small. When the apparatus would not return the condensation, no one thought of blaming the small pipe. Some one suggested that the supply main be carried to the other end of the system before branches were taken off. This remedied the circulation. The need of large mains then became apparent.

"In 1859 a ventilating system was installed in the Capitol at Washington, which is still running. The centrifugal fan in this installation has a 13-ft. wheel with wooden blades.

"Sheet iron stoves were in use in the New York City public schools as late as 1880. To-day the ventilating apparatus in New York's school, in my judgment, is better than any systems that I know of.

"Ventilation by open windows is a very old subject. I believe, however, that apparatus can be constructed that will ventilate a building without requiring the opening of windows. I am of the opinion, though, that all apparatus should be so constructed that the opening of the windows would not destroy the balance, so as to meet the objections of the natural ventilation agitators.

"The tendency of the present time is to call ventilation by open windows 'natural' ventilation. Previous to about 1880 there was nothing but natural ventilation in the schools of New York. The death of Miss Gibbs, a prominent schoolteacher of those days, who died of malarial fever attributed to natural ventilation, caused a hue and cry and drew attention to the almost entire lack of ventilation in the New York Public Schools.

"Systematic ventilation is not new, and it has been hashed and rehashed from the time of the building of the Parliament Houses in London by Sir Christopher Wren to about 1880 without any material progress being arrived at. About 1880, however, not only New York, but all the great cities of America, came to the conclusion that the schools, at least, should be systematically ventilated, and the progress of the art from that time to the present has been systematic and in the right direction, because there were magazines which then began to give particular atttention to this subject, particularly The Sanitary Engineer.

"The Sanitary Engineer was the pioneer journal in the United States that first gave any considerable consideration to his matter. For six or eight years it labored in this field and then passed on to civil engineering under another name. The seed it sowed, however, was not lost, and the heating and ventilating magazines of to-day are bravely carrying on the work.

"Since 1880 the progress of the work has been recorded and encouraged, and until quite recently the heating and ventilating engineer thought that he was arriving at something like a state of perfection.

"A London manufacturer, however, who made weather-cocks and chimney-tops, discovered that systematic ventilation was 'a joke,' and he issued expensive pamphlets under the guise of being reports of Royal Commissions, to show that the effort made in the improvement of ventilating in closed spaces since the time of Sir Christopher Wren was an entire failure, and that the only way to secure fresh air was by 'natural means and his chimney-tops and weather-cocks.' His method of louvred windows and weather-cocks might do for southern Europe, but I am of the opinion had he lived in Canada or the northern states of America that he would have slightly modified his opinions and not have sent his literature over here.

"When the speaker was a boy in the old-fashioned schoolhouses of more than sixty years ago, there was nothing but naural means for ventilation. These means, however, we could not use in cold weather, and I remember distinctly that we not only put sand-bags along the lower edge of the outer door, but that we put listin around the cracks of the doors and windows, and frequently stuffed the keyhole to keep out the wintry blast (there were no rubber weather strips in those days).

"Advocates of systematic ventilation conceived the idea of admitting fresh air through an especially prepared opening and of placing some kind of heating surface in the opening. It was crude at first, but it developed, and will still develop, if the desire to return to primitive methods will cease.

"Natural ventilation is no ventilation. Systematic ventilation has some pretence. It, at least, provides means of admitting air to a building other than through keyholes or at the door threshold, and it leaves the windows so that they can be opened, provided the apparatus is properly designed. In this respect systematic ventilation is as good as natural ventilation, and it has the advantage that if you do not like your bread buttered, you can leave the butter off and eat the bread dry.

"In the matter of hospitals, it probably has been shown that more recoveries take place under canvas or on screened verandas than in the hospital wards, and this fact, if it is a fact, in all cases, will justify the physician in putting his patient out of doors or in removing the window sash, but the same methods cannot be applied, at least to schools in crowded cities.

"A child can be taught in the open air, if the child is properly clothed for it,

and it may be the little brain is capable of a greater effort, but little children who have laid aside their wraps and who have wet feet and moist clothing cannot be educated in a shelter tent, nor can sufficient fresh air be admitted to an ordinary class-room containing forty children in cold weather through open windows. It would not only cause the children discomfort and suffering, but it would cause sickness and inflammatory troubles, and perhaps death.

"The condition for the school-room and the condition for the hospital are entirely different problems and should receive entirely different treatment. The amount of air required under the law of the State of New York for schools cannot be admitted by open windows in cold weather.

"Will the advocate of the natural ventilation method for schools imagine his child to be sitting in a little chair in the apex of the two outer walls of the school-room with the air from two open windows focusing on his child?

"Will any father or mother permit it in the case of their child?"

D. D. Kimball, the next speaker, talked on the "Relation of the Architect to Ventilation." He spoke of the meagre appropriations usually set aside for the heating and ventilating equipment and of the need of impressing the architects with the importance of dust removing and humidifying apparatus as well as that for the air supply.

Hugh J. Barron gave some of his own reminiscences, stating that at the period referred to by Mr. Baldwin he was employed as a steam fitter's helper.

Referring to an occasion when he was engaged in setting up a boiler for a heating plant in Philadelphia, P. Gormly being the contractor, he told how he had objected when it was proposed to connect the returns to the boiler and of his surprise when the job was found to work. It illustrated, he said, the vague ideas on the subject of heating that prevailed in those days. Mr. Barron expressed the pleasure he felt in the listening to the recital of conditions in the early days of the trade and congratulated the chapter in being able to bring together so many men interested in the same line of work.

James A. Donnelly described the chief end of the New York Chapter to be the making of an engineer. He suggested that the society should make an effort to enlarge its junior membership as the best method of building up an efficient organization. He also urged a deeper interest on the part of the society in the college courses in heating and ventilation. He predicted that the growth of heating engineering would keep pace with the increasing ranks of heating engineers.

Frank K. Chew suggested that the chapter another year provide for an architects' night, a young men's night and a consulting engineers' night.

Other speakers were F. G. Issertell and J. Armour, while Frank J. Corbett sang a number of songs.

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### New Constitution Adopted.

Announcement is made by Secretary W. W. Macon that the new constitution which was submitted to mail ballot in accordance with the action taken at the recent annual meeting of the society, has been adopted by a vote of 87.5 per cent. of those cast, two-thirds being necessary. A separate amendment, defining quite specifically the prerogatives of the board of governors, was defeated, as but 30.3 per cent. of the votes were in its favor. The new constitution will go into effect next year when the governing body, which will be known as the council, will consist of twelve members, while the present board of governors consists of nine members.

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### Gills for Houses.

A physician living in Kansas City, Mo., reports a remarkable illustration of what he calls "gills" for supplying oxygen to rooms which were poorly ventilated. Writing in the *Medical Record*, he states that in his household natural gas is used for fuel and light, that this gas has so little odor that its presence is not readily detected, and that one night the gas which had been lighted in the upper hall communicating with the sleeping apartments was extinguished during the night by reason of lowered pressure.

The pressure rose during the night, filling the bedrooms with gas, but the family slept comfortably until it was awakened by a roaring noise, which was found to proceed from the open gas jets.

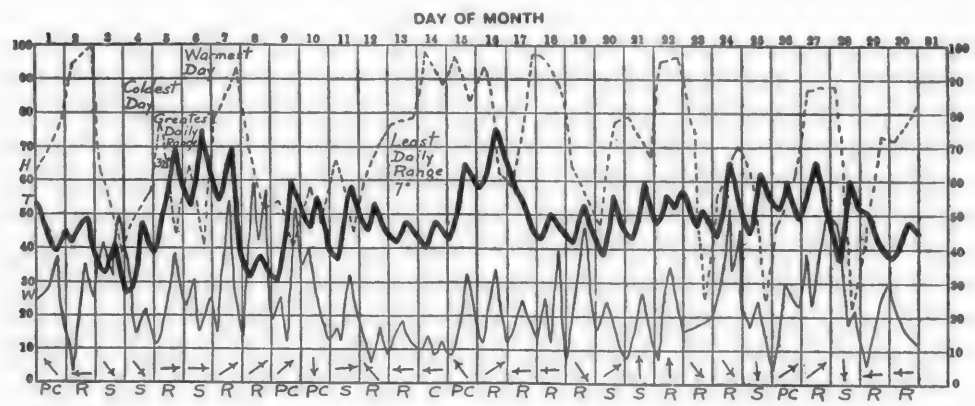
The doctor praises the "bridge" that enabled his family to survive this dangerous experience by ascribing it to an arrangement for ventilation which he had adopted and called "gills," because it supplies oxygen as do the gills of a fish.

The apparatus consists of "a yard square of 6½ oz. drill or muslin sheeting stretched and secured upon a light frame or a summer screen to fill the lower half of one window in each room." The doctor enters into a scientific and correct explanation of the modus operandi of these gills, which is omitted here. It is sufficient to call attention to this simple and efficient device for ventilating sleeping and living rooms during the cold winter months—an important and usually unappreciated preventive for colds and pneumonia.

Not the least interesting feature of this "discovery" is the fact that these "gills" have been in practical use at our agricultural stations and in many well conducted poultry farms. The method has therefore been thoroughly tested.

# The Weather for April, 1912

| | New York. | Boston. | Pittsb'g. | Chicago. | St. Louis. |
|---|---|---|---|---|---|
| Highest temperature, deg. F. | 74 | 77 | 80 | 75 | 80 |
| Date of highest temperature | 6 | 16 | 15 | 14 | 14 |
| Lowest temperature, deg. F. | 27 | 27 | 29 | 31 | 34 |
| Date of lowest temperature | 4 | 4 | 3 | 2 | 2 |
| Greatest daily range, deg. F. | 32 | 36 | 35 | 31 | 26 |
| Date of greatest daily range | 5 | 7 | 7 | 4 | 4 |
| Lowest daily range, deg. F. | 7 | 1 | 6 | 2 | 11 |
| Date of lowest daily range | 13 | 14 | 3 | 17 | 16 |
| Mean temp. for month, deg. F. | 49 | 47 | 53 | 49 | 57 |
| Normal mean temp. for month, deg. F. | 48.1 | 45.3 | 51 | 45.9 | 56.1 |
| Total rainfall, inches | 3.61 | 3.07 | 4.32 | 2.55 | 7.84 |
| Total wind | ..... | ..... | ..... | ..... | ..... |
| Total snowfall, inches | Trace | 0.5 | 2.5 | 0.1 | Trace |
| Normal precipitation, this month, inches | 3.30 | 3.55 | 2.9 | 2.88 | 3.52 |
| Total wind movement, miles | 14,926 | 8,354 | 10,494 | 11,907 | 8,476 |
| Average hourly wind velocity, miles | 20.7 | 11.6 | 14.6 | 16.5 | 11.8 |
| Prevailing direction of wind | N. W. | West | N. W. | S. W. | South |
| Number of clear days | 7 | 4 | 7 | 14 | 10 |
| Number of partly cloudy days | 11 | 8 | 13 | 7 | 11 |
| Number of cloudy days | 12 | 18 | 10 | 9 | 9 |
| Number of days on which rain fell | 22 | 19 | 16 | 12 | 14 |
| Number of days on which snow fell | 0 | 2 | 3 | 1 | 0 |
| Snow on ground at end of month, inches | None. | None. | None. | None. | None. |


DAY OF MONTH
Warmest Day
Coldest Day
Greatest Daily Range 32°
Least Daily Range 7°
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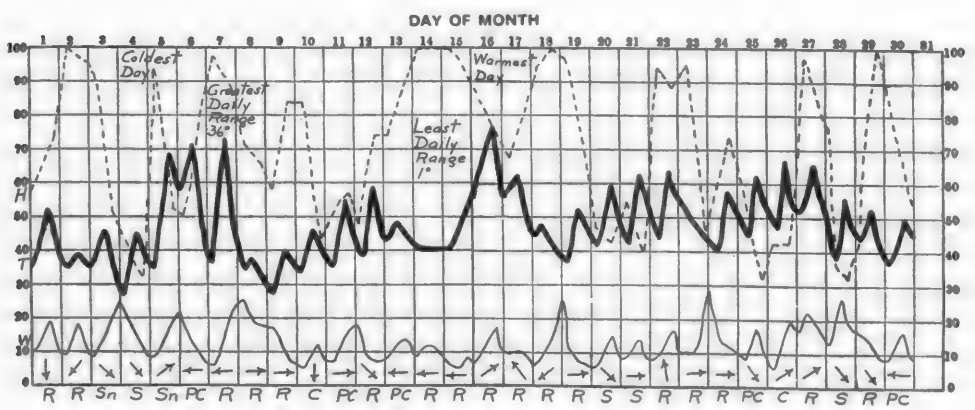
RECORD OF THE WEATHER IN NEW YORK FOR APRIL, 1912.


DAY OF MONTH
Coldest Day
Greatest Daily Range 36°
Warmest Day
Least Daily Range 1°
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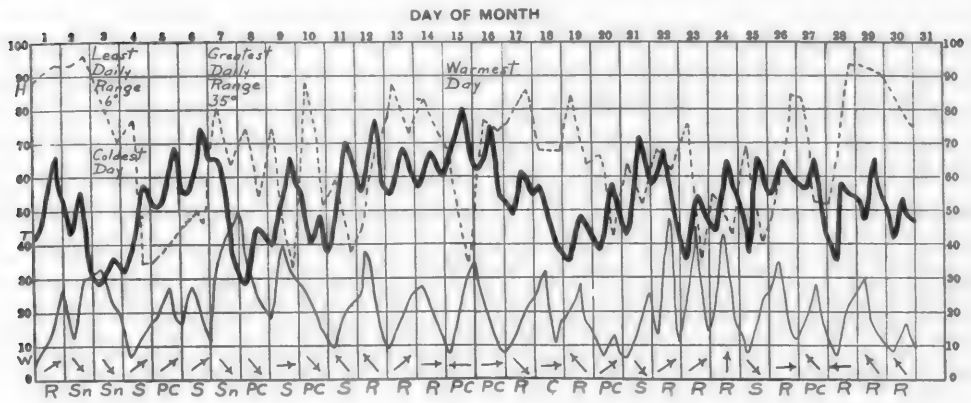
RECORD OF THE WEATHER IN BOSTON FOR APRIL, 1912.


DAY OF MONTH
Least Daily Range 6°
Greatest Daily Range 35°
Warmest Day
Coldest Day
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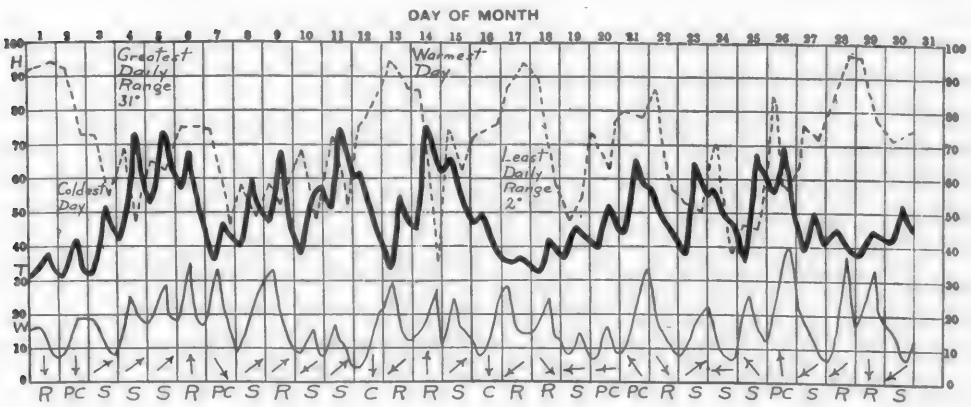
RECORD OF THE WEATHER IN PITTSBURG FOR APRIL, 1912.


DAY OF MONTH
Greatest Daily Range 31°
Warmest Day
Coldest Day
Least Daily Range 2°
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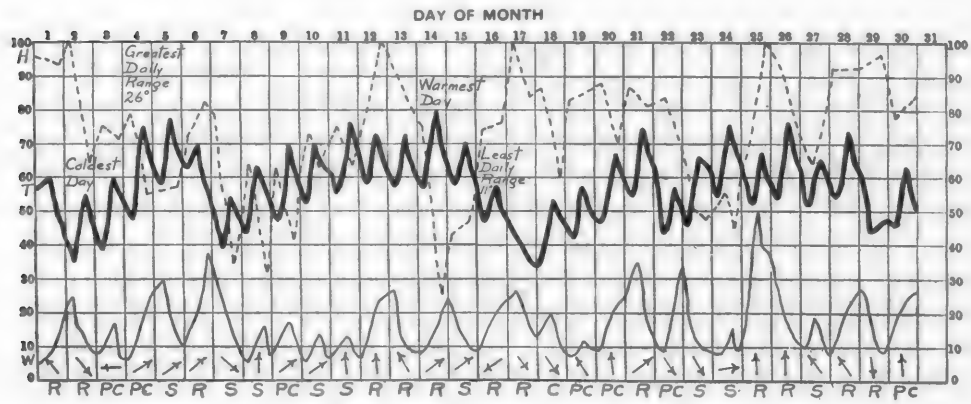
RECORD OF THE WEATHER IN CHICAGO FOR APRIL, 1912.


DAY OF MONTH
Greatest Daily Range 26°
Warmest Day
Coldest Day
Least Daily Range
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R R Pc Pc S R S S Pc S S R R R S R R C Pc Pc R Pc S S R R S R R Pc

RECORD OF THE WEATHER IN ST. LOUIS FOR APRIL, 1912.

Plotted from records compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings taken at 8 A.M. and 8 P.M.
S—clear; P C partly cloudy; C—cloudy; R—rain; Sn—snow.
Arrows fly with prevailing direction of wind.

# CORRESPONDENCE

### Distribution of Air in Rooms

Editor HEATING AND VENTILATING MAGAZINE:

Referring to your article in the May number by Mr. M. T. Stevens, the article is very interesting, showing how serious conditions can be in public buildings even after sufficient amount of money has been spent to give good ventilation. We are not quite clear as to what method Mr. Stevens recommends for getting an even distribution of the fresh air through the room, but we believe the question of introducing the air at a slow velocity into rooms has been greatly overdone and the engineers have paid too much attention to the people who complained of the drafts.

We believe in introducing the air at as high velocity as is possible and, often times, it is practicable to get quite a rotative velocity of the whole air in the room. It is impossible to send the air across the room and into all corners in one horizontal plane. The velocity becomes so slow before the air reaches the middle of the room that its force in some directions would be entirely lost, whereas if the whole current of air is held together in a compact mass and blown to the further wall it will turn the opposite corner and make a complete revolution of the room. If the vent duct is properly located the whole mass of air will have a rotative motion and at the same time a downward blaw and the fresh air being introduced at the top will finally reach the breathing line. The higher the velocity of the air into the room the less liable it will be for a stagnant mass of air to remain in one corner of the room and the contamination of the air be run up in some quarter to away above what it is in the average of the whole room.

C. W. ROGER.

Chicago, Ill., May, 1912.

### Current Heating and Ventilating Literature

*Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the articles mentioned may be obtained from* THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

FEED-WATER HEATERS

Test of a Feed Water Heater at the Naval Engineering Experiment Station, Annapolis, Maryland. Test to determine the B.T.U. transmitted per sq. ft. of heating surface per hour, under varying conditions. Ills. 2500 w. Jour. Am. Soc. of Nav. Engrs.—Feb., 1912. 40c

HOT-WATER HEATING

Pressure Hot-Water vs. Steam Heating. Discussed relative amounts of heat given off by water and steam at equal temperatures. Frank L. Busey. 1000 w. Met. Wkr. —March 29, 1912. 20c

HOTEL PLANT

Heating and Ventilating System of the Ritz-Carlton Hotel, N. Y. Charles A. Fuller. Brief illustrated description. 2000 w. Power—March 19, 1912. 20c.

### Topics for Disscussion for Heating Contractors.

Some light on trade conditions which it is sought to improve through association effort is contained in the notice of the twenty-third convention of the Pennsylvania Association of Master Steam and Hot Water Fitters, which meets June 8 at the Hotel Walton, Philadelphia.

After stating the programme for this meeting which includes an address on "Membership in Trade Associations as a Factor in Reducing Overhead Expense," by Secretary M. G. Sellers, giving practical suggestions for increasing the efficiency of association work, the notice adds the following as possible topics for reference to committees or for discussion:

Have you obtained more security in your contracts, both as to payments and labor?

Have you safeguarded your proposals in wording and scope?

Have you improved your forms for shop orders, time cards, and progressed toward uniform practice on allowance for overtime?

Have you suffered from infractions of the Trade Resolutions?

Have the efforts at standardization of flanges and fittings benefitted you?

Are you prepared to discuss proposed laws governing taxes, compulsory compensation and other legislation affecting your business interests, both at Harrisburg, Pa., and Washington, D. C.?

### Paul System Company of New York to Dissolve.

Announcement is made by the directors of the Paul System Company of New York that as soon as certain suits brought by the company to recover damages for infringements of its patents are terminated, the company will be dissolved. The reason is given that since the material patents owned by the company have expired, the earnings are no longer sufficient to meet current expenses. The patents in question expired October 1, 1911. The fact that they would expire at that time, the directors state, began to affect the company's business several years ago, as its trade asset was entirely in the royalty for the use of the Paul system. The company's trade competitors, continues the statement, took advantage of this to as-

sure prospective users that the rights the company had to sell would not be of long duration.

To meet this condition the company has been gradually curtailing operating expenses. Its original contract with A. G. Paul, the inventor of the system, guaranteed him a minimum payment of $500 per month from the royalties received by the company, but on January 1, 1909, a new arrangement was made with Mr. Paul, because of the company's refusal to longer pay this sum, under which the minimum payment to him was reduced to $100 per month.

The statement is signed by Albert A. Cryer, vice president; Norman H. Evans, secretary, and George Livingston, John S. Gibson and T. B. Cryer, all directors.

### International Association for Testing Materials.

A special bulletin has been issued by the International Association for Testing Materials, announcing the details of its forthcoming sixth congress, to be held September 2-7, 1912, in the Engineering Societies Building New York. The names of delegates to the congress appointed by foreign governments, as well as those representing many foreign and American engineering societies, are given, the list including the name of Prof. James D. Hoffman, University of Nebraska, Lincoln, Neb., who will represent the American Society of Heating and Ventilating Engineers. The proceedings of the congress will be conducted in English, German and French, with the aid of competent interpreters. Secretary Reitler states that over 150 reports and papers are in hand or promised. About thirty-five American papers are included in the list.

An elaborate programme of excursions is being arranged in connection with the congress, including trips to important points in New York and vicinity, and special excursions, largely for the benefit of the foreign visitors, to Atlantic City, Washington, Pittsburg, Gary, Ill., and Buffalo.

### The Thermostat in Operation

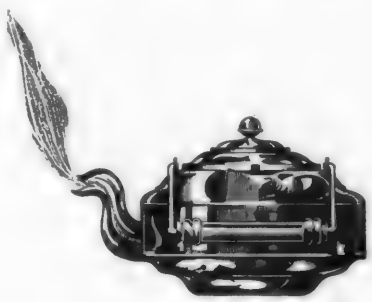
In this advanced age of advertising and energetic salesmanship there is hardly an architect or engineer who is not more or less familiar with the different systems of temperature regulation. Notwithstanding this fact, the majority of office building tenants, hotel guests, school teachers and the hundreds of others whose daily comfort is dependent upon the thermostat, are ignorant of the purpose and aim of the temperature control system.

Everyone understands the principle of an electric switch, and that is all a thermostat is, an automatic switch; the only difference being that it is operated by compressed air and not by electricity. When an electric light switch is turned on and you do not get light there is a reason, and in the majority of cases the trouble is not in the switch, but is caused by the absence of current. It is so with a thermostat; when a thermostat opens a steam valve or heat damper and there is no heat, it is not the fault of the thermostat, and when a room has a large glass surface exposed to the sun and becomes overheated, it is not the fault of the thermostat. The thermostat will have turned off the heat at the proper temperature, but it has no control over the heat from the sun rays.

The manufacturers of thermostats have perfected the various systems so that any trouble or parts liable to get out of adjustment have been localized in the thermostat, and any mechanic with even less skill than the average can make adjustments and slight repairs that may become necessary after two or three years of service.

### The Teakettle as an Illustration of Vapor Heating.

Getting heating satisfaction at no more pressure than there is in a teakettle is the way the Moline Vacuum Vapor Heating Co. expresses the operation of the Moline heating system. It answers the question frequently asked as to just what is vapor heating. Among the advantages mentioned for this system are that it combines all the good features of steam and hot water heating systems, and heats with the rapidity of hot air. Also that the heat can be regulated to suit the requirements and



that a radiator shut off entirely does not freeze, because it will contain no water.

In the Moline system the air and water are separated at the condensing radiator and ejector. The water returns to the boiler, the air being expelled through the air trap and vacuum valve. There are no automatic valves on the radiators and no pumps are used. Full information regarding vapor heating in general, with specific reference to the Moline heating system, may be had from the Moline Vapor Vacuum Co., Moline, Ill. The company states that it has a plan for helping the contractor that would be well worth knowing.

## Separate Specifications and Contracts for Heating and Ventilating Work on Public Buildings in New York State.

The separation of heating and ventilating work and of plumbing and gas fitting on all public buildings in New York State is provided for in a new law recently passed by the New York State Legislature. In future, specifications on public contracts in New York State will provide that "a separate and distinct proposal is required for each of the following items of work:

"(a) Heating and ventilation.

"(b) Plumbing and drainage."

The law is known as Senate Bill No. 715 and is entitled "An act to amend the general municipal law and the State finance law in relation to the awarding of contracts." Following is the act in full:

Section 1. Article five of chapter twenty-nine of the laws of nineteen hundred and nine, entitled "An act relating to municipal corporations, constituting chapter twenty-four of the consolidated laws," is hereby amended by adding at the end a new section, to be section eighty-eight, to read as follows:

§ 88. *Separate specifications for certain contract work. Every officer, board, department, commission or commissions charged with the duty of preparing specifications or awarding or entering into contracts for the erection, construction or alteration of buildings in any county or city, or the borough of any city, when the entire cost of such work shall exceed one thousand dollars, must have prepared separate specifications for each of the following branches of work to be performed:*

*1. Plumbing and gas fitting.*

*2. Steam heating, hot water and ventilating apparatus.*

*Such specifications must be so drawn as to permit separate and independent bidding upon each of the classes of work enumerated in the above subdivisions. All contracts hereafter awarded by any county, city or borough, or a department, board, commission or commissioner or officer thereof, for the erection, construction or alteration of buildings or any part thereof, shall award the respective work specified in the above subdivisions separately to responsible and reliable persons, firms or corporations. Nothing in this section shall be construed to prevent the authorities in charge of any county or municipal building from performing any such branches of work by or through their regular employes, or in the case of public institutions by the inmates thereof.*

§ 2. Article two of chapter fifty-eight of the laws of nineteen hundred and nine, entitled "An act relating to state finance, constituting chapter fifty-six of the consolidated laws," is hereby amended by adding at the end thereof a new section, to be section fifty, to read as follows:

§ 50. *Separate specifications for contract work for the state. Every officer, board, department, commission or commissions charged with the duty of preparing specifications or awarding or entering into contracts for the erection, construction or alteration of buildings for the state, when the entire cost of such work shall exceed one thousand dollars, must have prepared separate specifications for each of the following branches of work to be performed:*

*1. Plumbing and gas fitting.*

*2. Steam heating, hot water and ventilating apparatus.*

*Such specifications must be so drawn as to permit separate and independent bidding upon each of the classes of work enumerated in the above subdivisions. All contracts hereafter awarded by the state, or a department, board, commission, commissioner or officer thereof, for the erection, construction or alteration of buildings or any part thereof, shall award the respective work specified in the above subdivisions separately to responsible and reliable persons, firms or corporations. Nothing in this section shall be construed to prevent the authorities in charge of any state building from performing any such branches of work by or through their regular employes, or in the case of public institutions by the inmates thereof.*

§ 3. This act shall take effect September first, nineteen hundred and twelve.

## Economy Shown in Operating Test on Gas Heaters

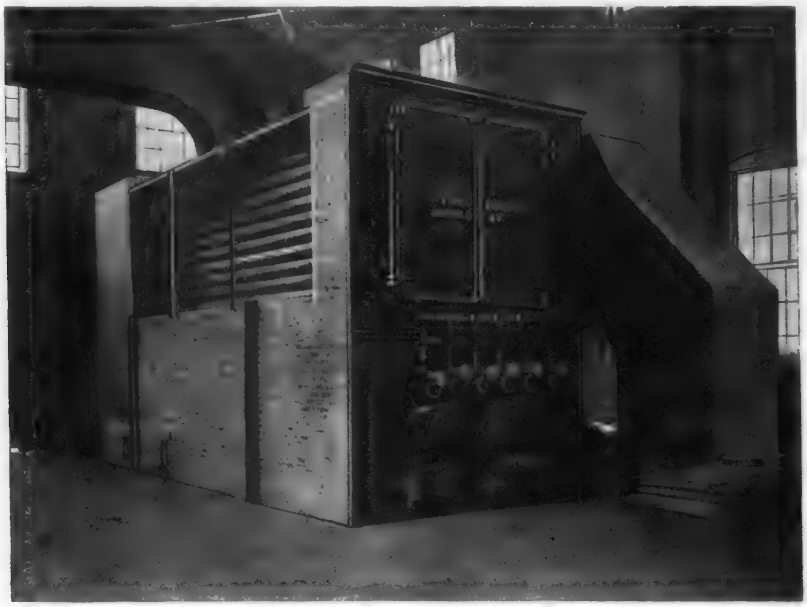
An operating efficiency of 85% on two large Buffalo gas heaters, installed at the new works of the American Rolling Mills, Middletown, O., is reported by the engineers of the Buffalo Forge Co., as the result of a recent test of this apparatus. This installation is interesting in that the storage and warehouse building, over ⅛-mile long and about 125 ft. wide, is heated by the hot blast system, without the use of boiler, steam heater coils or direct radiation; the heat of burning gas being transferred direct to the distributed air. Heat loss is eliminated and the test showed an average operating efficiency, as stated, of 85%, as against the usual 50% obtained in the common boiler.

In appearance and design the gas heaters resemble a horizontal water-tube boiler. Each heater consists of a bank of American ingot iron boiler tubes, 4 in. in diameter, expanded at both ends into a heavy boiler plate. The external heating surface in each heater is 2,620 sq. ft.

In the front fire brick combustion chamber are located six Gwynn gas burners, so designed that abundant air for combustion is obtained from the outside atmosphere. The grates are so arranged that if it ever becomes necessary to abandon the use of gas, by simple changes, coal or oil may be used. Great care was taken in the design and construction of this chamber so that complete combustion would occur here, resulting in the greatest heat from the gas.

The hot gases at a temperature of 3,000° F. are baffled to the back of the heater. These, however, are manifestly too hot to put directly into the tubes and expect them to stand up under service. This trouble is avoided and incidentally the efficiency increased (waste heat up the stack being obviated) by recirculating the gases emanating from the cold end of the horizontal tubes. Two-thirds of these cold gases at approximately 400° F. are sucked back into the return air chamber by means of a double discharge, 80-in. Conoidal fan. The hot gases of combustion at 3,000° F. and the recirculated gases at 400° are here mixed, giving a resultant temperature of 1,400° F.

The gases then pass up and back through the inside of the horizontal tubes. The pure air for distribution in the building is drawn through the clear area around the tubes, the heat transfer occurring here, and is forced through the duct system by means of 130-in. Conoidal fans.



INSTALLATION OF BUFFALO GAS HEATER EQUIPPED WITH CONOIDAL DISTRIBUTING AND RECIRCULATING FANS.

The test was conducted on February 27, last. At 10 A. M. the outside temperature was 21° F., it seldom being colder in this region, gradually rising to 32° F. at 1 P. M. One heater was located in the extreme east end of the building, the other the west end. A mild west wind was blowing.

The test was started at 10 A. M. and lasted until 1 P. M., readings being taken every hour. The results are tabulatel below.

LOG OF HEATER TEST, AMERICAN ROLLING MILL CO., MIDDLETOWN, O., FEBRUARY 27, 1912.

| Readings. | | East End Heater. | West End Heater. | Average. |
|---|---|---|---|---|
| 130-in. Conoidal fan (main distributing unit) | Speed, R. P. M. | 202 | 202 | 202 |
| | Cu. ft. per min. | 52,860 | 52,740 | 52,800 |
| | Total pressure, in. | 1-7/16 | 1-9/16 | 1½ |
| Double discharge, 80-in. Conoidal fan (recirculating unit) | Speed, R. P. M. | 293 | 293 | 293 |
| | Pressure, bottom discharge, in. | 5/16 | 5/16 | 5/16 |
| | Pressure, open stack, in. | 9/32 | 3/8 | 5/16 |
| | Suction, inlet, in. | 3/8 | 7/16 | 13/32 |
| Draft in fire box, in. | | 5/32 | 3/16 | 3/16 |
| Draft in combustion chamber, in. | | 5/32 | 5/32 | 5/32 |
| Gas presure on burners (turned on) in. | | 10-1/4 | 4-3/4 | .... |
| Gas pressure on burners (turned off), in. | | 17-3/4 | 17-1/4 | .... |
| Cubic feet gas burned per hour (average) | | 4,480 | 4,595 | .... |
| Size of gas main, in. diameter | | 4 | 3 | .... |
| Temperature of air entering heater, deg. F. | | 67 | 62 | 65 |
| Temperature of air at distributing fan, deg F. | | 138 | 129 | 133½ |
| Temperature of room, deg. F. | | 65½ | 65½ | 65½ |
| Efficiency, per cent | | 88 | 82 | 85 |

In commenting, it might be of interest to state that the apparatus was guaranteed to heat the building to 60° F. in zero weather when 11,000 cu. ft. of gas per hour or 5,500 cu. ft. per heater was burned. It was further guaranteed that the heaters would have an efficiency of 80%.

At no time during the test were the burners turned on full, it being unnecessary, since the outdoor temperature was such that 65½° F. was maintained in the building without it. An average of 9,074 cu. ft. of gas per hour was burned, instead of the rated 11,000. A 3-in. gas main fed one heater, a 4-in. main the other. The heater having the 4-in. main had about twice as much pressure on its burners and was the heater showing the 88% efficiency. The main Conoidal fans at a speed of 202 R.P.M. have a rated capacity of 45,500 cu. ft. of air per minute; they actually delivered 52,800 cu. ft.

The efficiency of the heaters was computed by equating the B.T.U. value of the gas to the B.T.U. absorbed by the air. The average of the two heaters was 85%. While there were no readings of radiation losses taken, it is safe to assume that at least 5% of the 15% total loss was through radiation. The heaters are inside the building, and, therefore, this radiating heat passed into the building and helped to heat it. Approximately 90% of all the heat of the fuel used in these heaters was, therefore, introduced in the building.

### Garland Ventilator for Buildings

The Garland principle of ventilation, which has been used on passenger cars for several years, is being employed in designing ventilators for warehouses, shops, power houses, railway stations, freight houses and similar buildings; also for chimney tops and smoke jacks.

Around the upper end of the main air shaft, which is divided into flues, or air shafts, as shown in the illustration, is a series of auxiliary ducts, so arranged as to raise the cross air currents and deflect their movement upward and across the corresponding series of flues in the main air shaft. The current of air flowing through the auxiliary ducts is designed to produce a positive induction action, always upward through the flues in the main air shaft, and from the interior of the building.

The Garland ventilator has overcome the danger of down drafts in two ways: first, by dividing the main air shaft, which has an effect equivalent to the combination of several small ventilators, into one large one, making the large single opening unnecessary; second, by the formation of a film of flowing air from the auxiliary ducts across the upper ends of the main air shaft flues.

The air shaft of the Garland ventilator being square instead of round, is easily applied to all kinds of buildings, skylights or smoke stacks; in many cases it can be applied without the use

GARLAND VENTILATOR FOR BUILDINGS.

of an expensive and cumbersome base. These ventilators are made and sold by Burton W. Mudge & Co., People's Gas Building, Chicago.

**Safety in Exhaust Steam Heating Systems,** is the title of a circular letter that is being sent out by the Harrison Safety Boiler Works, 3189 No. 17th St., Philadelphia, Pa., in which the statement is made that "just as you have a safety valve on the boiler, you need a safety valve on a heating system receiving exhaust steam. If the heating system is unable to dispose of the steam as fast as delivered by the engine, the pressure may rise even to boiler pressure, resulting in the bursting of heaters, receivers, fittings, radiators or other connected apparatus." Back pressure valves are described as the safety valves of the exhaust steam circuit and the Cochrane multiport safety exhaust outlet valve is featured as having the necessary construction to render it especially safe for this purpose. These valves are built to meet all situations, such as vertical flow, horizontal flow or for installation in angles in the piping by means of which the cost of an elbow in the piping may be saved. The circular contains an illustration of this device in colors in which the various parts are indicated, the colors showing the different metals used. There are also

detailed drawings. The letter constitutes a new and interesting form of personal circular.

**Graphite** for May, 1912, published by the Joseph Dixon Crucible Co., Jersey City, N. J., contains, among other interesting matter, a continuation of the sketch by Elbert Hubbard of "Joseph Dixon, one of the World Makers."

**Cino Iron Body Gate Valves,** for 100 lbs. pressure, made by the D. T. Williams Valve Co., Cincinnati, O., are described in a newly-issued circular. This valve was especially designed to meet the demand for an all-round serviceable iron body gate valve for low pressure service. The company states that it has not been possible heretofore to secure an iron body gate valve in the smaller range of sizes, embodying the double disc feature which is to be found in this valve. The illustrations include a broken view, with the parts described by letter. Various types of the valve are made in sizes ranging from ½-in to 6-in. diameter, the circular containing full price lists and dimensions.

**The Indicator Book** is the title of an attractive catalogue recently issued and now being distributed by the Trill Indicator Co., of Corry, Pa., containing a description of the latest types of engine indicators and accessories, with information on the taking and reading of indicator charts. Size 6x9 ins. (standard). Pp. 48.

**Uehling $CO_2$ Meters and Waste Meters** are the subject of Bulletin 103, just issued by the Uehling Instrument Co., Passaic, N. J. These meters consist of machines for measuring pneumatically either $CO_2$ or both $CO_2$ and temperature. The bulletin describes in concise manner the $CO_2$ and waste meters and the recorders and indicators which are combined in different ways to form different styles of $CO_2$ and waste meter equipment. Size 3½x6 in. (standard). Pp. 16. The company has also published a treatise on "Combustion and the Cost of Power," which contains a considerable amount of information concerning combustion and boiler efficiency with particular reference to how high boiler efficiency may be maintained by the use of Uehling $CO_2$ meters and waste meters. Size 6x9 in. (standard). Pp. 36.

**John Willy Hotel Directory** of the United States and Canada, listing about 15,000 hotels, has been published by the Hotel Monthly, 443 South Dearborn St., Chicago. It sells for $1.00.

**Bristol's Recording Gauges,** for pressure and vacuum, are discussed in one of the most exhaustive catalogues that have come to our notice, just published by the Bristol Co., Waterbury, Conn. In addition to describing at length the company's line of these types of gauges, accompanied by large and carefullly executed reproductions from photographs, illustrating the various types, the catalogue includes a number of full size facsimile sections in colors of charts showing records obtained of steam boiler pressures, vacua with condensing engines, gas pressures, etc. Other views show specimen sections of charts so arranged that particulars regarding any form of chart may be seen at a glance; they are also numbered for convenience in ordering. A partial list of users is presented in connection with which it is stated that more than 25,000 Bristol's recording gauges have been sold. Size 10½x8 in. Pp. 64. The catalogue is No. 1,000.

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# NOISELESS

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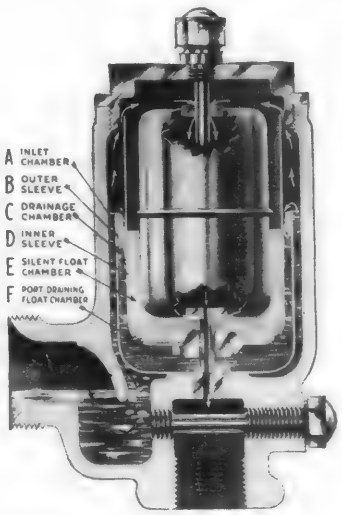


**In the MONASH NOISELESS RADIFIER the float and drainage chamber are separate, each to perform its individual function. In the drainage chamber (C) drainage into the return is direct, rapid and absolute. In the silent chamber (E) the body of water is always still with a slight and gradual lowering of the line of flotation—thereby insuring silence in action of the motor float.**

**ATTENTION**—To Heating Engineers who are interested in specifying Vacuum Heating Systems and who will write us on their letterhead, we will send our ***Book of Blue Prints*** showing typical installations for MONASH NOISELESS SYSTEM of Vacuum Heating. The information contained in this book has never before been published. Write at once as the edition is limited.

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# TRADE AND MISCELLANEOUS NOTES

### Coming Events.

**June 10-13, 1912**—Twenty-fourth annual convenion of the National Association of Master Steam and Hot Water Fitters, Atlantic City, N. J. Headquarters at the St. Charles Hotel.

**June 25-27, 1912**—Fourth annual convention of the National District Heating Association, Detroit, Mich. Headquarters at the Hotel Cadillac.

**July 11-12, 1912**—Mid-summer meeting of the American Society of Heating and Ventilating Engineers, Detroit, Mich. Headquarters to be announced.

**Sept. 24-26, 1912**—Fourteenth annual conference of the American Hospital Association, Detroit, Mich.

### Deaths.

**William C. Bryant,** city engineer of Holton, Kansas, died April 6, 1912. Mr. Bryant was a member of The American Society of Heating and Ventilating Engineers.

### Miscellaneous Notes.

**Kalamazoo, Mich.**—An outside heating plant is being designed for the Frank Street school. The present heating equipment will be used and a fan system of ventilation installed.

**University of Wisconsin,** Madison, Wis., announces the opening, on June 24, of the twelfth annual six weeks' summer school of the College of Engineering. Courses of instruction and laboratory practice are offered in electrical, hydraulic, steam and gas engineering, mechanical drawing, applied mechanics, testing of materials, machine design, etc. A bulletin containing particulars may be had from F. E. Turneaure, of the university.

**National Founders' Association** has moved its general offices to the National Life Building, 29 South La Salle St., Chicago.

**Detroit, Mich.**—A petition containing a protest against the smoke and soot from the plant of the Central Heating Co., on Farmer Street, has been signed by nearby residents for presentation to Corporation Counsel Lawson. The complainants say that the cause of the trouble is the use of slack coal, faulty stoking and the blowing out of the flues at night. The books in the public library are said to be badly damaged by the soot.

**Buffalo, N. Y.**—Trouble has arisen over the contract for the heating of the J. N. Adam Memorial Hospital, at Perrysburg, due to the fact that the contractors, Foster & Glidden Co., substituted a vacuum heating system for the gravity system specified and also installed steel pipe, instead of wrought iron. The claim is made by the contractors hat an engineer in the Board of Public Works approved the plans for the substitution of the vacuum system. Also the company's interpretation of the specifications for the piping differs radically from that of the Commissioner of Public Works. The aldermanic Finance Committee has recommended that the contract for the completion of the work be awarded to the John W. Danforth Company, of Buffalo, at its bid of $17,832. It is proposed to make an allowance of $900 for the heating material already installed. The Foster & Glidden Co. had been paid about one-third of the contract price and the work was nearly finished when the difficulty arose. The matter will likely be settled in court. The Foster & Glidden Co. will continue with the plumbing work. Their bids for both heating and plumbing amounted to $16,500,

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but the new plans call for increased radiation, which accounts for the increased cost.

**Philadelphia, Pa.**—Superintendent of Public Schools Martin G. Brumbaugh has announced that, in future, plans for school buildings will provide for additional space per pupil. Statistics compiled by the Philadelphia Board of Education show that of the more than 350 school buildings, there are about 168 which fall short of the standard requirements of 30 sq. ft. of floor space to each pupil. In some cases it has been shown that the space per pupil is less than 1 sq. ft.

**Austin, Minn.**—At the first meeting of the new City Council, a petition signed by 252 of the prominent business and professional men of the city was presented, asking for the installation of a central heating plant in connection with the local municipal water and electric plant.

**Youngstown, O.**—A series of tests on heat radiators for passenger cars is now being carried on by the engineering department of the Pennsylvania State College under the direction of Prof. A. J. Wood. The Pennsylvania Railroad and the Safety Car Heating & Lighting Co. have indicated their intention of awaiting the result of these tests before going further with the system that they now have under way.

**Duluth, Minn.**—The Virginia Plumbing & Heating Co. has commenced work on the extension of the municipal heating plant from Jones and Forest streets to the new school building. Six carloads of material have arrived which will be used in tne work.

**St. Louis, Mo.**—A strike is in progress on the Laclede Gas Company's big building, due to the fact that the contractor for the heating work, the John B. Hughes Heating Co., employed a number of steam fitters who are members of the International Association of Journeymen Steamfitters. This led to a walkout of the structural steel men, concrete workers, plumbers, etc. The steamfitters have two associations in St. Louis, and the International Association is not affiliated with the local Building Trades Council. The trouble is similar to that which arose in Chicago last year, and is a continuation of the factional war between the International Association of Journeymen Steamfitters and the United Association of Plumbers and Steamfitters, which is attempting to absorb the International Association. The building affected is one of the largest in the city. Edward W. Leonard, of Chicago, general organizer of the United Association, is conducting the strike.

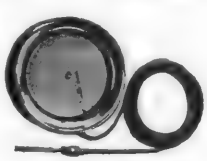
**Youngstown, O.**—At the request of the Mahoning County Medical Society, City Solicitor Jenkins is preparing an ordinance providing for a minimum amount of air space in tenement rooms per occupant. The local medical men, basing their calculations on the laws adopted in Columbus, Milwaukee and other cities, declare that there should be not less than 400 cu. ft. of air space for each adult and 200 cu. ft. for each child occupant of a tenement room.

**Stratford, Can.**—The City Council has received a petition from A. C. McLeod of the McLeod Milling Company for a franchise for a central steam heating system. The company intends to enlarge its flour mill and, in connection therewith, to supply steam for heating purposes to the business section of the city.

**Iowa City, Ia.**—Condemnation proceedings will be instituted by the State Board of Education to secure ground for the new hospital heating plant, which will be located on the east side of Gilbert Street. The plant will represent the farthest eastward extension of the university grounds. With this purchase the university will own land in eight blocks east and west.

**Richmond, Ind.**—A petition for a central station heating franchise has been presented to the Richmond Board of Public Works by Byram Robbins, attorney, representing, it is reported, a large corporation. The Mayor has appointed City Attorney

INDUSTRIAL INSTRUMENTS



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JOSEPH DIXON CRUCIBLE COMPANY, Jersey City, N. J.

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Gardner and Engineer Fred R. Charles to investigate the proposition and report.

**Smoke Inspection Day** for Des Moines, Ia., will be named in the near future by Mayor James R. Hanna, when the smoke abatement commission will visit the heating plants in the city. A committee representing owners of large heating plants in Des Moines will be invited to accompany the commission. Owners of heating plants in the city are being notified by Harry McNutt, smoke inspector, that plans for installation of smoke consuming devices must be filed and approved by the smoke department before June 15, as after that date all violators of the smoke abatement ordinance will be prosecuted. Six devices have the approval of the department for high-pressure plants and ten devices for low-pressure plants.

**Oshkosh, Wis.**—The Berlin Public Service Company, which operates an electric light and heating plant at Berlin, has acquired the property of the Berlin Gas Co. and the corporations will be consolidated. Charles W. Radford and John Challoner, it is stated, were the owners of the gas company.

**American Society of Engineer Draftsmen,** at its regular monthly meeting in the Engineering Societies Building, May 16, were favored with a lecture on "Practical Applications of the Slide Rule."

**First Annual Report of the Director of the Bureau of Mines** has been published. It contains, among other things, details of the bureau's fuel investigations, including inspection of Government fuel purchases, steaming tests, combustion experiments, weathering and spontaneous combustion of coal, lignite and peat investigations, physical investigations relating to fuels, work of the chemical laboratories, etc. The report takes up fifty-seven pages.

**American Institute of Metals,** the new title of the American Brass Founders' Association, will hold its annual convention in Buffalo during the week commencing September 23. Headquarters will be at the Hotel Iroquois.

**Hudson County (N. J.) Association of Master Steam and Hot Water Fitters** effected a temporary organization at a meeting held in Jersey City, April 25, with E. W. Moore as president and James P. McLaughlin, secretary.

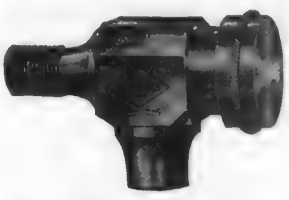
**Milwaukee, Wis.**—The suggestion of a city ordinance requiring that every room in a building inhabited by persons shall have at least one window with a certain amount of glass and the upper section of which shall open, has been made by the Anti-Tuberculosis Society of Milwaukee, as the result of a report submitted to the society by Miss Harper, a trained nurse, who has been making an investigation of the city's housing conditions.

**Fort Dodge (Ia.) Light & Power Co.** has submitted to the City Council a tentative ordinance setting forth the conditions under which the plant and mains for the proposed new central station heating system shall be built and operated. The life of the ordinance is given as 25 years. The matter of rates is left open. The company reserves the right to establish rules as to the manner and extent of fittings in buildings with proper pipe for the distribution of heat, provided no consumer be required to install more pipe than enough to maintain 72° F. in weather 10° F. below zero, with steam at 1 lb. pressure. Heat shall be furnished from October 1 to June 1 following whenever the temperature shall be 65° F. or lower. Heat shall be sold by meter measurement to consumers in district served by company unless consumer requests heat shall be measured by square feet of radiation. The company shall furnish heat to any applying consumer and extend its system of mains provided consumer shall contract for five years to take $400 worth of heat annually for every 300 ft. of main laid, provided distance from plant is not so great that condemnation will be excessive. The plant must be of sufficient capacity to heat 100 buildings.

**Melvern F. Thomas** has resigned from the R. P. Bolton Co., New York, consulting engineers, to become associated with James McAlear, Fisher Building, Chicago, in the same field of consulting engineering. He will make his headquarters in Chicago.

**Hastings, Neb.**—A new corporation, to


**Jenkins Automatic Air Valves**



for the removal of air from steam radiators, heating coils, etc. Thousands in use and giving entire satisfaction. They are inexpensive, neat in design, and take up no more room than an ordinary air cock. Besides being very simple, they are most sensitive and durable.

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be known as the Hastings Heat & Power Co., has presented a petition to the City Council of Hastings for a 20-year franchise for a central station heating and power plant, to be built during the coming summer. The incorporators are Karl Kauf, George Tyler, C. G. Wallace, A. L. Clarke and William M. Dutton. Mr. Dutton is the president of the new company. It is proposed to lay steam pipes in the alley between First and Second streets, running from St. Joe west to Barlington, and in the alley between Second and Third streets. It is planned also to take in that part of the city including the high school, Y. M. C. A. building and courthouse.

### Manufacturers' Notes.

**Beard & Beard,** Reading, Pa., announce that they are now the sole manufacturers and distributors of the line of Sunshine steam and hot-water boilers, formerly manufactured by Orr, Painter & Co. S. H. Beard was long identified with the manufacture of the Sunshine line.

**Alonzo H. Magee Co.,** 106 Beekman St., New York, has failed, witth liabilities of $61,000 and assets of $5,000. The company was incorporated in 1905 with a capital stock of $30,000, to manufacture air valves and other heating and plumbing specialties. The capital stock was later increased to $75,000. The business will be continued for the present by the receiver, A. Leo Everett.

**Chamberlin Metal Weather Strip Co.,** Detroit, Mich., has moved its New York City branch to new quarters at Fourth Avenue and 31st Street. The company has opened a branch office in Des Moines, Ia., under the management of H. W. Reed.

**McCrum-Howell Co.** receivers have made a preliminary report of the financial condition of the company, as of March 14, showing assets, including patents, rights, good will, etc., amounting to $2,662,957, of which $25,920 is cash, $650,607 accounts receivable, and $668,577 inventories. The plants and investments are placed at $1,181,007. Liabilities, including bills payable, claims of merchandise creditors amount to $2,250,663. Manufacturing instructions were issued by the receivers on April 23 to the boiler, radiator and enamelware plants at Norwich, Conn., and Uniontown, Pa., to resume full capacity as the receivers, it was stated, had in hand a full volume of orders.

**Mackay Mfg. Co.,** New York, has moved to new quarters at 234 Water Street, in the building formerly occupied by the Richardson & Boynton Co. The company manufactures the Manhattan line of steam and hot water boilers and radiators, which are displayed in the company's showroom on the ground floor, the upper floors being devoted to executive offices and storerooms. The company's new factory at Manasquam, N. J., comprises ten acres of ground and four acres of floor space.

**Frank L. Patterson Co.,** 26 Cortlandt St., New York, announces that among the high-class apartment houses nearing completion in New York, which will have hot water satisfaction for their tenants furnished by Patterson plumbers' tank heaters, are The Baierford, Prince Monaco, Feora Villa, The West End, The Sound View, The Regnor, The Lucania and The Rexor.

### New Incorporations.

**Utah Plumbing & Heating Co.,** Salt Lake City, Utah, capital $5,000. President and Treasurer, Otto E. Moske;

THE MOLINE SYSTEM HEATING

**Heats at Tea Kettle Pressure.**

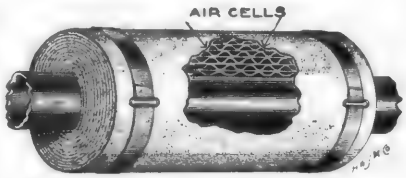
Less fuel, less labor. Heats at a turn of the valve. Noiseless. Every job a big boost for another. Profits *right*.

Valuable book for *contractors* FREE. Write.

**Moline Vacuum-Vapor Heating Co. (Dept. E), Moline, Ills.**

**J-M Asbestocel**

**Pipe Covering Prevents Fuel Waste**




J-M Asbestocel Covering is built on the arch principle, with the air cells running around the pipe, preventing any possible circulation of air. This covering confines the greatest amount of dead air (the secret of perfect insulation).

Being made of Asbestos, J-M Asbestocel fireproof and prevents danger of fire from overheated pipes. It will not crack, crush down or crumble, and retains its insulating efficiency for an indefinite period.

For hot water and low and medium pressure steam, J-M Asbestocel will prove a big winner among your clients.

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Vice-President, John H. Osborne; Secretary, W. F. Albright.

**Charles C. Breyer Co.,** Chicago, capital $5,000. Incorporators—Charles C. Breyer, William Breyer and Charles C. Breyer, Jr.

**Central Heating Co.,** Milwaukee, Wis., capital $100,000. Incorporators—William F. Adams, J. Gilbert Hardgrove and S. J. McMahon. The company will furnish heat and power for public use.

**Wisconsin Installing Co.,** Milwaukee, Wis., capital $12,000, to install furnaces and heating devices. Incorporators—Charles H. Howleson, Ransom Bailey and Charles G. Woolcock.

**Garwood Gas Lamp & Heater Co.,** Canton, O., capital $50,000. Incorporators—C. R. Welch, A. M. McCarthy, Homer E. Black, G. A. Leonard and C. B. McClintock.

**Chicago Duplex Ventilating Co.,** Chicago, Ill., capital $20,000, to manufacture automatic ventilators. Incorporators—Roy D. Keehn, George C. Bliss and Mella J. Phelps.

**Emmert Hardware & Cornice Co.,** St. Louis, capital $15,000, to conduct a heating, plumbing and cornice business. Incorporators—William T. Emmert, Annie M. Emmert and Henry Warning.

**Boyland & Co.,** Virginia, Minn., capital $25,000, to conduct a heating and plumbing business. Incorporators—M. Boyland, H. Boyland and J. P. Boyle, of Eveleth, Minn.

**Noble Milne Co.,** Pittsfield, Mass., capital $20,000, to conduct a heating and plumbing business. Directors—J. Wesley Noble, Charles W. Noble and William Milne.

**American Heating & Construction Co.,** Los Angeles, Cal., capital $200,000. Incorporators—Henry H. Mumford, S. Lydia Edmunds, James C. McInturff, Richard F. Geardt and Albert Glass.

**E. J. Claffey Co.,** Chicago, capital $2,500, to manufacture and deal in heating, plumbing and gas fitting plants and equipment. Incorporators—E. J. Claffey, C. F. Claffey and T. B. Claffey, Jr.

### Business Changes.

**Ohio Heating Co.,** Columbus, O., which will manufacture furnaces and steam heating apparatus at 694 Mt. Vernon Avenue, is practically ready to commenced operations. C. M. Buller, president of the company, recently disposed of his interests in the Weaver Heating Co., of that city, to W. D. Weaver.

**West End Plumbing & Heating Co.,** Utica, N. Y., has been organized to take over the business of Carney Bros. Co., at Columbia and Schuyler streets. The members of the new concern are John J. Rossiter, John Spohn and Edward A. Carney.

**Western Heat Regulation Co.,** Chicago, Ill., is the new name of the Western Heat-


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**The Largest Residence**—Chas. M. Schwab
Maurice Hebert, Architect. Alfred R. Wolff, Engineer

**The Largest Building**—Woolworth
Cass Gilbert, Architect. L. E. Eden, Engineer

**The Largest Mill**—American Velvet Mills
Russell G. Cory, Architect and Engineer

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# STANDARD SYSTEM

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**90 West Street, New York**

ing Co. The company has taken new quarters in the Monadnock Building.

**E. S. Gregory Plumbing Co.,** Rockford, Ill., one of the oldest heating and plumbing contracting firms in the city, has been dissolved, as a result of the death of Edward S. Gregory.

**Nashville Gas & Heating Co.,** Nashville, Tenn., has increased its capital stock from $100,000 to $3,100,000. The new capital will be used to acquire the stock of the Nashville Gas Co.

**Kupper & Wichman,** Davenport, Ia., have started a heating contracting business at 1442 West Seventh St., Davenport. The principals are Benjamin Wichmann, an experienced furnace man, and John Kupper, of Walcott.

**Sterling Vacuum Cleaner Co.,** Worcester, Mass., has opened quarters in the Baker Building at 86 Foster St., for the sale of a new vacuum cleaner. Frederick H. Fisher, of Hartford, Conn., is president and treasurer.

### Contracts Awarded.

**Mueller Co.,** Milwaukee, Wis., heating and ventilating State Capitol at Madison for $16,770. Other contracts for work on the Capitol amount to $380,683.

**Columbus Heating & Ventilating Co.,** Columbus, O., heating Sidney High School building. F. L. Packard is architect.

**Kauffman Heating & Engineering Co.,** St. Louis, Mo., heating Bondurant Hospital on Seventh Street, St. Louis, for $3,595.

**E. Keeley & Co.,** Chicago, heating plant for the Lincoln State school and colony at Springfield, Ill., for $19,286.

**American Warming & Ventilating Co.,** Toledo, O., heating Stroher School for $4,500.

**La Velle & Hogan,** Sioux City, Neb., heating St. Catherine's Academy at Jackson, Neb., for $4,060.

**I. D. Moore & Co.,** Tifton, Ga., heating and plumbing new dormitory building for the South Georgia Normal and Agricultural College at Valdosta, Ga.

**George McGhan & Son,** Valdosta, Ga., heating and plumbing county jail at that place for $4,350.

**W. T. Delahunty & Co.,** Decatur, Ill., heating new courthouse at Mt. Pleasant, Ia., for $4,740.

**P. A. Sweeney,** Salem, Mass., heating and ventilating and plumbing Saltonstall School at that place for $6,559. Other bids were: F. A. Wendell, $7,437, and John F. Cabeen, $7,371.

**Pacific Blower & Heating Co.,** San Francisco, Cal., heating and ventilating high school at Corning, Cal., for $5,000; also heating and ventilating Union High School at La Grande, Cal., for $3,000.

**Munger & Munger,** Pasadena, Cal., heating and ventilating Polytechnic High School at San Diego, Cal., for $17,000.

**J. A. Doraghty,** Ottawa, Ill., heating St. Stephen's Convent School at Streator, fflIll., for $4,464.

**C. E. Thomas,** Richmond, Cal., heating new Tenth Street school at that place for $7,879.

**Abrahamson & DeGear,** San Francisco, Cal., heating new Richmond Avenue school.

**Mangrum & Otter,** San Francisco, Cal., steam heating and ventilating First Church of Christ, Scientist, at California and Franklin streets, for $4,373.

**John O'Hare Co.** Clarksburg, W. Va., heating, plumbing and lighting systems for the ten-story Union Bank Building. A vacuum steam heating system will be installed.

**Fall River Steam & Gas Pipe Co.,** Fall River, Mass., steam heating Greene Building on Pleasant Street.

**Latourette & Fiscal Co.,** Sacramento, Cal., heating Frommer Building at that place for $2,797.

**E. D. Hough,** Los Angeles, Cal., heating and ventilating Y. M. C. A. Building at San Bernardino, Cal., for $4,100; the plumbing and vacuum cleaning contracts went to the San Bernardino Hardware Co. at its bid of $2,857.

**C. A. Albee Plumbing Co.,** Springfield, Mass., steam heating Buckingham School at that place for $3,588.

**John G. Sutton Co.,** San Francisco, Cal., steam heating, plumbing and gas fitting four-story Olcovich Building at Polk and Pine streets for $5,300.

### Business Chances.

**Washington, D. C.**—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until June 21, 1912, for the installation of a heating and ventilating apparatus, etc., for the United States Post Office and Court House Building at Charleston, W. Va.

Until June 25, 1912, for the construction, including plumbing, gas piping, heating apparatus, electric conduits and wiring, etc., of the United States Post Office at Mansfield, O.

Until June 27, 1912, for the extension, remodeling, etc., including plumbing, gas fitting, heating apparatus, etc., of the United States Post Office at Chester, Pa.

Until July 1, 1912, for the construction, including plumbing, gas piping, heating apparatus, etc., of the United States Post Office at Newark, O.

Until June 29, 1912, for the construction including plumbing, gas piping, heating apparatus, etc., for the United States Post Office at Austin, Tex.

Until July 8, 1912, for the construction including plumbing, gas piping, heating apparatus, etc., of the extension, remodeling, etc., of the United States Post Office at Portsmouth, O.

Until July 9, 1912, for the extension, remodeling, etc., including plumbing, gas piping, heating apparatus, etc., of the United States Post Office at Evanston, Ill.

Until July 10, 1912, for the extension,

# Positive Ventilation of Toilets

no matter where located is possible by the

## Sturtevant

### METHOD OF TOILET VENTILATION

This apparatus which consists of a Sturtevant Ready-to-Run Ventilating Set with special intake and discharge ducts, is very easy to install, may be purchased at small cost, and its operating expense is extremely low.

The air in toilets entirely without means of natural ventilation may be kept sweet, pure and free from obnoxious odors. The apparatus is positive in action regardless of weather conditions. Its operation is independent of the main ventilating system.

The sanitary laws for toilet ventilation are fully met by the installation of this apparatus.

**B. F. STURTEVANT COMPANY**

**Hyde Park, Boston, Massachusetts**

**and principal cities of the world**

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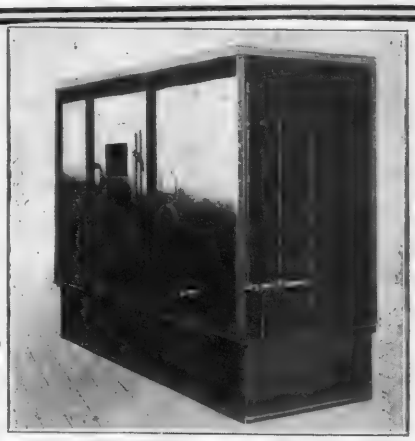

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Type "A" Air Washers designed specifically for AIR COOLING. Remarkable efficiency.
Mist Nozzles used, ATOMIZE the spray water—the fine mist presenting an enormous water surface, for absorbing heat from the air.
Standard Air Washers designed specifically for AIR CLEANSING, but give a fair COOLING effect.
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remodeling, etc., including plumbing, gas piping, heating apparatus, etc., of the United States Post Office at Lansing, Mich.

Until July 30, 1912, for the construction complete, including plumbing, gas piping, heating apparatus, etc., of the United States Post Office at Billings, Mont.

**Des Moines, Ia.**—In the report of the secretary of the board of managers of the Home for the Aged in Des Moines, one of the immediate needs of the institution is stated to be a new heating plant.

**Bay City, Texas.**—Estimates are being prepared for a central steam heating plant for the public schools of the city.

**Rock Island, Ill.**—Lewis & Kitchen of Chicago, are drawing final plans for the new central heating plant to heat the new Industrial Arts Building, the high school and the Lincoln School in Rock Island.

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**Norwich Plumbing Supply House,** 55-57 West Main St., Norwich, Conn., Elkin Smith, proprietor, is a new firm dealing in heating, plumbing and tinsmiths' supplies. The company states that it will be pleased to receive catalogues from manufacturers of mill supplies, steam fitters' and tinsmiths' supplies, and plumbing supplies and fixtures.

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## Trade Literature.

**Richardson Boilers,** with 50-in. grates, for large work, are illustrated and described in a 4-page circular, devoted to this latest addition to the line of boilers made by the Richardson & Boynton Co., New York. This boiler is, in many ways, the most notable addition to the company's already large line of cast-iron sectional heaters. It has a large amount of heating surface exposed to the action of the fire, being especially designed to raise the temperature of the water quickly and to generate steam with economy of fuel. The boiler is of similar design and construction to the company's well-known 25-35-42 series, and is made in half sections for convenience in erecting. It has an ample smoke-box, with sliding damper and check-draft damper, and has also a yoke connection at the back, which is furnished with the boiler, so that both halves of the boiler may be drained equally. Cored openings are furnished in the rear section, so that a coil can be placed in the fire-box for heating water for domestic purposes. The folder includes ratings and dimensions for five sizes, with capacities ranging from 5,000 to 9,000 sq. ft. for direct steam and from 8,250 to 14,850 for water.

**Our Hat's in the Ring** is the title of a clever folder expressing a challenge on the part of the A. Wyckoff & Son Co., Elmira, N. Y, to any one to prove that the company's improved cypress steam-pipe casing is not superior to all other casings on the market to-day. The use of cypress was lately adopted in the construction of this covering, being described as the only wood that is not affected by the changing wet and dry conditions which exist in a steam-pipe trench, as against white pine and tamarack, which, it is stated, will rot if not always wet or always dry.

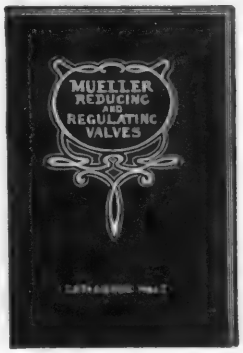
**"Central Station Heating; or, Conserving the Heat Unit,"** a paper read by J. A. Bendure before the Wisconsin Engineering Association, at Madison, Wis., February 13-15, 1912, has been reprinted by the American District Steam Co., No. Tonawanda, N. Y., and is being sent out as the company's Bulletin 125. In considering the factors connected with the laying out of an underground distribution for steam heating, the writer says:

"The amount of space to be heated in each block, the factor of maximum demand and the proportioning of the sizes of main supply and branches to give the required amount of steam at periods of maximum demand, and of sufficient capacity to furnish at least a pressure of 1 lb. at the service valve of each customer with 5 lbs. pressure at the power house.

"Care as to the kind of insulation to be employed and its protection from all the elements that are found in the soil below the surface of the streets, multiplied by the numerous gas, water and sewer lines with their attendant leakage where they run parallel to, or across the steam mains and service lines.

"The method of installation and its protection must be of such a character that settlement of the trench or the pressure of the earth will not cause the pipe to become out of level or alignment, as the pipe must have easy movement between expansion devices or else undue strain on such devices will cause breaks and leaks. The outer covering must also be of such a nature that expansion and contraction of the pipe within and the changes of temperature between that of the earth and the pipe itself will have no bad effect on the material used, otherwise cracks at the joints if it be tile, or concrete, permitting the circulation of air and seepage of water, not only causing excess condensation within the main itself, but a rapid deterioration of the pipe."

On this point the writer states that after more than 30 years of trial and with a record of 90 per cent. of all the central station plants in existence to its white pine or wood log has been found to be by far the best class of insulation and protection to underground steam mains. Special emphasis is laid on the importance of care in construction, even at a high cost, in order to prevent undue condensation, losses later on, as as

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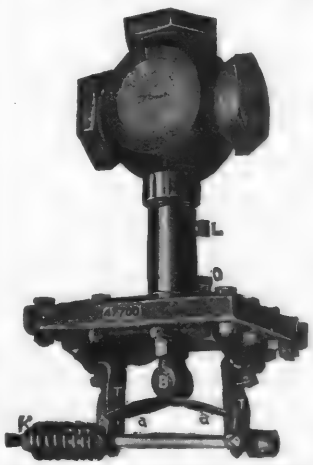

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Made in sizes ¾-inch to 12 inch. Smaller sizes 2-inch and under, are fitted with brass bodies; larger sizes have iron bodies, composition mounted and composition *renewable seats*.

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## Foster Engineering Co., Newark, N. J.

initial saving may very soon be used up in such losses. Size 6x9 in. (standard). Pp. 8. The company also prints, as Bulletin 126, "Confessions of an Engineer," by R. P. Warren. Size 6x9 in. (standard) Pp. 8.

**What We Dry** is the title of a well illustrated booklet on dryers, just published by the Ruggles-Coles Engineering Co., 50 Church St., New York and McCormick Building, Chicago. It tells in a short, interesting way the reason why various materials are dried and gives the names of some of the prominent Ruggles-Coles dryer installations. It should prove of especial interest to those at all interested in the subject of drying.


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**Mechanical Equipment of Federal Buildings Under Control of the Treasury Department.** By Nelson S. Thompson, chief mechanical and electrical engineer, office of the supervising architect. Second edition, revised and enlarged. Contains the basic data used in the design of the mechanical and electrical equipment of Federal buildings under the control of the Treasury Department. Also contains data for approximating the cost of the various parts of the work. The book takes in heating and ventilation, plumbing, stationary and portable vacuum cleaning plants, engines and generators, motors and controlling apparatus, forced systems of hot water heating, commercial practice in factory heating, etc., and other valuable data. Cloth, $2.00.

**Central Station Heating.** By Byron T. Gifford. This work presents the most advanced practice in central station heating, both steam and hot water, and is an invaluable guide, not only to the engineer, but to municipalities and public service commissions where district heating is being, or will be, used. 208 pages, with 42 figures, including 50 pages of miscellaneous engineering data. Size 6 x 9½ in., bound in flexible leather. Price, $4.00.

**Mechanics of Heating and Ventilating.** By Konrad Meier. Including a series of ten charts containing data relating to the flow of water, steam and air, collected by Mr. Meier during an experience of 26 years in heating and ventilating work, both in this country and abroad. Each of the charts replaces a series of tables on the subject, giving at a glance the result of a calculation from any combination of factors. 161 pages, illustrated, with ten large charts. Size 6 x 9 in. Price, $5.00. Separate sets of charts, printed on cloth, with lines in different colors and mounted on boards. Single charts, $1.50. Sets of ten charts, $15.00.

**Heating and Ventilating Buildings**, a standard manual for heating engineers and architects. By Prof. R. C. Carpenter. Fifth edition, largely rewritten. 577 pages, 277 illustrations, 8vo, cloth, $4.00.

**Handbook for Heating and Ventilating Engineers.** By Prof. James D. Hoffman and Benjamin F. Raber. The latest book on this subject. Unusually comprehensive. 320 pages, with 45-page appendix. Size 4½x6¾ in., bound in flexible leather. Price, $3.50.

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**Ventilation of Buildings.** By William G. Snow and Thomas Nolan. 83 pages. Pocket size. Contains a statement of the general principles of ventilation and of their application to different kinds of buildings. Boards, 50c.

**Steam Heating and Ventilation.** By Wm. S. Monroe. Containing formulas and data valuable in the designing of heating and ventilating plants. Price, $2.00.

**Steam-Electric Power Plants.** By Frank Koester. A practical treatise on the design of Central Light and Power Stations and their economical construction and operation. 473 pages. 340 ills. Price, $5.00.

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**Practical Steam and Hot Water Heating.** By Alfred G. King. Containing over 300 detailed illustrations. The book is a working manual for heating contractors, journeymen steam fitters, architects and builders. Describes various systems of heating and ventilation and includes useful data and tables for estimating, installing and testing such systems. 8vo. 367 pages. Price, $3.00.

**Dean's System of Greenhouse Heating,** by steam or hot water, with formulas for obtaining different temperatures, by Mark Dean. Price, $2.00.

**Power, Heating and Ventilation.** By Charles L. Hubbard, B.S., M.E. A treatise for designing and constructing engineers and architects. The whole subject of heating is covered, including the heating of large institutions with central plants. Space is also devoted to electrical matters connected with steam plants. 647 pages. Price, $5.00 (three volumes in one).

**Notes on Heating and Ventilation.** By John R. Allen. 152 Pages. 34 illustrations. Size, 4½x6¾ in. One of the new books, brought quite up to date, and containing much information to guide the intelligent steam fitter in the installation and heating and ventilating apparatus. Cloth, $2.50.

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**The Principles of Heating.** By William G. Snow. A practical and comprehensive treatise on Applied Theory in Heating. 161 pages. 42 illustrations. 38 tables. Size, 6x9 in. Cloth, $2.00.

**Modern Sanitary Plumbing, Steam and Hot Water.** By James J. Lawler. 400 pages. 228 illustrations. Size, 6x9 in. This is the latest edition of Mr. Lawler's well-known work on this subject. Price, $5.00.

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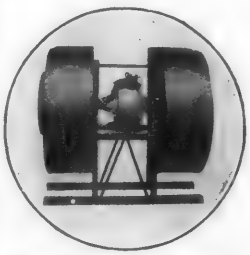

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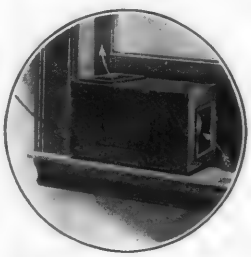

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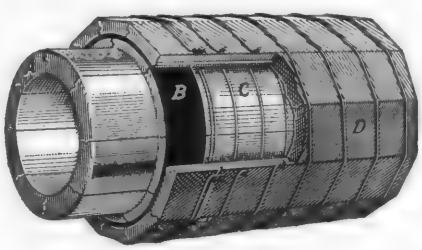


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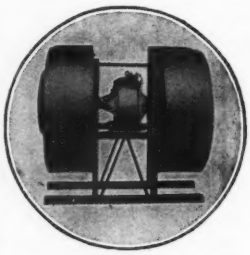

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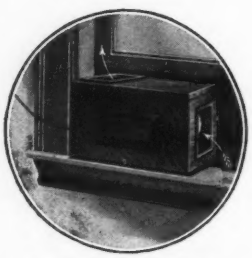

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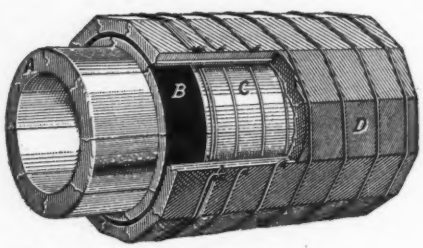


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